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Do You Know 195

Officers Nominated for 1959–1960 197

1959 YET Paper Contest 198

Articles

The Function of the Technical Museum in Engineering Education — Robert P. Multhauf 199

The Utilization Program of the President's Committee on Scientists and Engineers — William G. Torpey 205

Candid Comments: On Teachers' Salaries — Samuel B. Folk 212

The Place of the Junior College in Engineering Education — Kenneth Barnes 214

Candid Comments: Think Twice! 217

A 'Philosophy' Minor for Engineers — John A. Bishop 218

Engineering Analysis in Education — Erick A. Farber 221

Foreign Summer Jobs — F. R. Erskine Crossley 223

Education for Research and Development — Albert W. Davison 228

Communications and Electronics Research in the University — H. W. Welch, Jr. 232

Professional and Managerial Goals in Engineering Education: A Sociologist's Comment — Nahum Z. Medalia 237

Our Greatest Need in Science and Engineering Education — S. L. Mikhail 241

Engineering Problems Ahead and Their Meaning for College Educators — W. Scott Hill 244

YET-itudes: To the Young Members of ASEE — Jerry Richter 247

Graphic Science

Report of the Committee on Aims and Scope of Engineering Graphics 251

A More Effective Approach to Teaching Engineering Graphics — Carson P. Buck 253

National Science Foundation Aid for Education in Science and Engineering 256

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A Summary of Research Capabilities 258

Announcement of Awards 261

Cooperative Education Division Bulletin 262

Society Activities

Report of the Representatives of ASEE on the Council of the American Association for the Advancement of Science 265

Meeting of Executive Board 267

Reports of ASEE Officers 269

New Members of ASEE 286

Teaching Positions Available 204

Notes

Eric A. Walker Honored 198

Engineering Students Teach High School 211

History of Science and Technology 213

New Metallurgy Building at Colorado Mines 213

College-Industry Conference 216

The EJC Meeting in January 220

Goglia Dean at Notre Dame 222

Program of Engineering Mechanics, University of Illinois 231

Engineering Program at AAAS Meeting 236

Operations Research Short Course at Case 240

Research Coordinator Appointed for Catholic University 243

National Science Foundation Program Director for Engineering Sciences 246

Highway Bridge Design Competition 250

FluoSolids Symposium at Arizona 252

Two Federal Agencies Announce Increased Stipends for Fellowships 260

Harold A. Bolz Dean at Ohio State 264

Advanced Industrial Engineering Intensive Courses at Washington University of St. Louis 268

Arnold Named Director 285

DO YOU KNOW . . . .

► . . . . That the abstract of the minutes of the September meeting of the Executive Board is on page 267? Every member should read them because the discussions were primarily on topics determining the major activities of the Society for the next few years. Yes, even the structure of the Society itself will be influenced by the developments. The abstract also contains a few comments about the annual audit, which will be published in its entirety in the February 15, the yearbook-directory, issue of the JOURNAL.

► . . . . That work is progressing on listing all administrators, both educational and industrial, under an additional occupational heading in the yearbook-directory? The task may not be completed by press time, but all that is ready will be inserted.

► . . . . That the three mid-winter meetings sponsored by divisions of the Society are all national in scope and are as follows?

Cooperative Education—Chicago, Ill.—Jan. 8 & 9
Engineering Graphics—Detroit, Mich.—Jan. 21–24
College-Industry Conference—Houston, Texas—Jan. 26 & 27

► . . . . That the EJC Public Relations Committee makes a plea to all of its members to use the phrase "science and engineering" instead of "science and technology" as continually used in the press, radio, TV, advertising, and statements out of Washington? Wherever and whenever possible every engineer should rectify the situation by calling attention to the proper and preferred phrase, perhaps even "engineering and science."

► . . . . That the September 1957 "Reviews of Data on Research and Development" of the National Science Foundation was devoted to a review of a survey of funds for research and development in engineering schools, 1953–54, and contained definitions of basic research, applied research, and development? Basic research was defined as that type of research which is directed toward an increase of knowledge in science; it is research where the primary aim of the investigator is a fuller knowledge or understanding of the subject under study, rather than a practical application thereof. Applied research is that type of research which is directed toward practical applications of science. Development is the systematic use of scientific knowledge directed toward the production of useful materials, devices, systems, methods, or processes, exclusive of design and production engineering; it does not include quality control or routine production testing.

► . . . . That the Ford Foundation has appropriated four and a half million dollars to establish "Educational Facilities Laboratories"? This is an independent nonprofit organization concerned with the research and experimentation leading to improvement in the construction of school and college buildings. The agency will also serve as an information clearing house. Data on school design, building, and equipment will be available to architects, local school systems, college trustees, and others involved in the nationwide expansion of educational facilities anticipated throughout the country in the next decade. More than half of the funds will be used for experimentation in the fields of construction

and equipment through grants to educational institutions. Several cooperating experimental centers that will serve as research laboratories and demonstrations of efficient construction and furnishing of educational facilities also will be supported. This is meeting a vital need, since adequate buildings and equipment for the next ten years are estimated to cost forty billion dollars. This also is a significant step in view of some statements which have been made to the effect that all colleges now are raising money but some day they are going to be embarrassed when people stop and ask how well the money is being used.

► . . . . That the Junior Engineering Technical Society (JETS) has a new national director by the name of John W. Groomes? He is on the staff of Michigan State University and previously taught mathematics and physics at the Traverse City, Michigan, high school. Started in 1950 to encourage high school students who have aptitude for the engineering profession, there now are 350 JETS clubs in 37 states. Those interested in forming clubs should write to Director Groomes for information.

► . . . . That at the present time 60,000 pages a year of key Soviet scientific and technical journals are now being translated into English? Fifty-three English editions of Russian journals, four extensive series of translated Russian abstracts of scientific papers, and four series of partial translations of important Russian journals are now in print. Support for the translations is provided by four government agencies and six commercial translating and publishing firms working without government funds. This is in accordance with a report from the National Science Foundation.

► . . . . That many of the small liberal arts colleges in the United States have organized the Council for the Advancement of Small Colleges, Inc.? In the June 1958 issue of their newsletter, in discussing income of CASC colleges, the following statements are made. "A study by the Educational Testing Service shows that among CASC colleges academic excellence as measured by standard tests correlates better with the amount of tuition charges than with any other single factor such as size, location, or type of control. It is probably true that the more a student is asked to pay for an education, the more he will learn."

W. Leighton Collins
Secretary

ASEE ANNUAL MEETING

PITTSBURGH, JUNE 15-19, 1959

OFFICERS NOMINATED FOR 1959-60

The Nominating Committee met in Washington, D. C. on Friday, November 14, 1958 and selected the following candidates:

For **President,** one year.....B. R. Teare, Jr.

Dean of Engineering and Science, Carnegie Institute of Technology; vice president 1953–55; recipient George Westinghouse Award 1947; member since 1933.

For **Vice President,** General and Regional Activities East of Mississippi River, two years.....R. G. Owens

Dean of Engineering, Illinois Institute of Technology; member General Council 1956–58; member since 1944.

For **Vice President,** General Divisions and Committees, two years.....H. W. Barlow

Director Washington State Institute of Technology; member General Council 1947 and 1951; member since 1940.

For **Treasurer,** one year.....W. W. Burton

Employment Manager, Minnesota Mining and Manufacturing Co.; Chairman Ethics Committee; member since 1947.

ADDITIONAL NOMINATIONS

In accordance with the revisions of the constitution and by-laws adopted in June of 1957, *additional nominations may be made by petition* of fifty (50) signatures of members of the Society in good standing. The nominee must indicate a willingness to serve, if elected, before his name can be placed on the ballot. Petitions are to be submitted to the Secretary of the Society by January 15, 1959.

In the March issue of the JOURNAL OF ENGINEERING EDUCATION ballots giving the names of all candidates will be provided. Ballots received by the Secretary by March 31 shall determine the election of the officers as of April 1. Their terms of office shall begin ten days after the date of the annual meeting.

1959 PAPER CONTEST FOR YOUNG ENGINEERING TEACHERS

The General Council of the American Society for Engineering Education has authorized the sixth annual paper contest for young engineering teachers. Eligible are members of ASEE who will be under 36 years of age on June 1, 1959. These awards, known as "President's Awards," are first prize $200, second prize $100, and honorable mentions as determined by the Judging Committee.

Not to exceed 2,500 words, the papers should deal with some constructive approach to engineering education. Participants are encouraged to express their ideas on the development of engineering faculties, a topic requested by the CDEF Committee. All entries, which become the property of the Society, should be typed double spaced, and submitted in duplicate before March 1, 1959, to the Chairman of the ASEE Section in which the member resides. Papers having joint authorship or submitted in last year's YET or other paper contests are not eligible.

A Judging Committee from each Section will select the best sectional paper, which will be submitted to the ASEE Secretary before April 1, 1959. These papers will be submitted to a Final Judging Committee. The final winning papers are presented at the Annual Meeting and are usually printed in the JOURNAL. All papers, especially Section winners, are submitted to the JOURNAL and YET-itude editors and are given careful consideration.

ERIC A. WALKER HONORED

Dr. Eric A. Walker, president of the Pennsylvania State University, was cited at Washington by the Department of the Navy for his "outstanding contributions . . . in the fields of scientific research and development."

The department's Distinguished Public Service Award was conferred on Dr. Walker by Admiral Arleigh Burke, Chief of Naval Operations, in the name of the Secretary of the Navy. The ceremony formally closed Dr. Walker's two-year term as chairman of the Committee on Undersea Warfare of the National Academy of Sciences-National Research Council.

Dr. Walker, who will continue to serve as a member of the committee, was praised in the citation for his "leadership . . . inspiration . . . keen insight . . . and advice" on highly-complex long-range research and warfare.

The award is the highest of three conferred on civilians by the Department of the Navy. Dr. Walker has been a member of ASEE since 1938.

THE FUNCTION OF THE TECHNICAL MUSEUM IN ENGINEERING EDUCATION

ROBERT P. MULTHAUF

Head Curator, Department of Science and Technology
United States National Museum
Smithsonian Institution
Washington, D. C.

Presented at the Joint Conference of the Society for the History of Technology and the Humanistic-Social Division of ASEE at the 66th Annual Meeting in Berkeley, June 16, 1958. Recommended by the Humanistic-Social Division.

The collection of objects relating to science and technology is a practice which arose in Europe in the Renaissance, paralleling the rise of interest in science itself. In its origins it could probably be best described as a hobby. The instruments, astrolabes, sundials, and the like, were works of art, and wealthy patrons found their collection a philosophical—meaning scientific—pursuit which was at the same time aesthetically satisfying. When the more utilitarian instruments appeared, the telescope, microscope, air pump and static electric machine, they took their places in the cabinets of princes, in forms scarcely less elaborate than those of the astrolabes and dials.

The seventeenth century saw the emergence of a new objective for the collection of machines, the stimulation of invention through the collection and exhibition of prior examples of the art. Such a motive must have been in part responsible for the cabinet of engineering models established by the King of Sweden at the end of the century, and still to be seen in the Tekniska Museet, Stockholm. The early scientific academies, such as the Royal Society of London, and in this country the American Philosophical Society and the Smithsonian Institution, also maintained cabinets of models, and occasionally full sized machines. But the real efflorescence of the practice occurred when government patent departments undertook to exhibit models of patented inventions which were submitted by applicants.

In the middle of the nineteenth century a third type of technical museum appeared, the museum of industrial, agricultural and mineral products, a sort of permanent trade fair, promotional as well as educational in intent. Inasmuch as instruments and machines are industrial products, they were included among the objects collected by these museums, but raw materials remained the dominant subjects of their exhibitions.

Thus the end of the nineteenth century saw essentially three types of technical museum, the collection of antique instruments, the collection of machines, now chiefly patent models, and the collection of industrial products. Some museums comprehended —and confused—all three categories. The patent model museums were beginning to collapse onto the museums of products, as the physical problem of housing an immense number of models accelerated a growing doubt as to their utility. But the museums of products were already sorely pressed by an attempt to keep up-to-

date with the proliferating products of mine, mill, smelter, farm and woodlot. Increasingly they reminded the visitor of the proverbial needle-containing haystack. Writing in 1895, a leading American authority declared that the possibility of establishing a general technology museum remained to be demonstrated.[1]

In the first quarter of the present century a fourth type of technical museum was devised in Europe, inspired by the not unrelated objectives of commemorating the native scientific and technological genius and of supplementing the academic program of technical education. The result was something of a laboratory course extended in space rather than in time, arranged in some historical sequence to exploit the value of historic apparatus. In the last generation there has been a trend towards emphasis on science, at the expense of technology.

The Modern Museum

Today the confusion which reigned between the nineteenth century museums of antique instruments, machines and models, and industrial products, has been to a considerable extent settled. The typical museum has constructed its exhibits—or is reconstructing them—along the lines described in the last paragraph, and has organized the residues of its earlier collections into reference collections for consultation by specialists. This response to the changing taste of the museum visitor seems, at the moment, a satisfactory solution to the problem. Technology has not notably slackened its advance since the decline of the patent museum, and more than a few regard the whole episode as the product of a curious notion of our ancestors. One may suspect that this reflects the limitations of our own viewpoint, but in any case the technical museum today does not derive its principal justification from this function, but from its contribution to the preservation of our cultural heritage and to the inspiration of young people with an interest in science and technology. Few question the desirability of these objectives; indeed the appearance of a number of new museums in recent years suggests an increased appreciation of the utility of the museum in furthering these objectives.

The Museum's Contribution

Although it seems reasonable to view these functions as contributory to engineering education, a second look at the history of the museum suggests an area in which a more direct contribution might be made. The changes which I have mentioned in the concept of the museum reflect changes in technology itself; indeed, these revisions represent the museum's attempt to mirror several radically different ideas of the subject matter of technology and its needs. The museums remained through the middle of the nineteenth century essentially miscellaneous collections of mechanisms among which the mechanics and inventors of that empirical age were expected to find useful ideas. As engineers became more sophisticated, recourse to this source of inspiration came to be regarded as naive. As engineers became more prosperous, the disposal of the products of their ingenuity became as great a problem as their production, and, in the latter half of the century, the principal function of the museum was conceived to be the promotion of the products of technology, directed to the consumer. As the rivalry between technologists which this implies merged into a

[1] G. Brown Goode, "The Principals of Museum Administration," *Annual Report of the Smithsonian Institution* (Washington, 1897), Vol. II, p. 214.

rivalry between great industries, and then between industrialized nations, the commemoration of the native technological genius became a museum function. Again in the twentieth century the principal change to come over engineering is reflected in and symbolized by the museum. Today the great British technical museum goes under the name "Science Museum."

So the technical museum has faithfully revised itself—to the best of its ability—to conform to each in turn of these radically differing views of technology. The earlier conceptions have left residues, however, partially because of the longevity of museum specimens, but also because the changes which have taken place in the ideology and methods of technology are especially conspicuous to those who have the task of exhibiting it. In wrestling with the problems of revision of exhibits and of making technology meaningful to the general public, museum people have become aware of a fact which seems to be less generally recognized in the engineering profession. Technology, even modern technology, has reached a stage at which it has a history of its own, a history which is more complex than a mere chronology of who invented what and when.

A century ago technology was emerging from a long period of gradual development. The engineer's training, too, was a matter of gradual development. It began with an apprenticeship in the venerable techniques of his craft and advanced cautiously to the more complex, or newer, in a way which tended to recapitulate its history, much as the life history of the individual was once held by a school of evolutionary biologists to recapitulate that of the species. Any specific inquiry into the history of the steam engine had little meaning to men who lived when Watt, and even Newcomen, engines were still in use. It was generally assumed that whatever of past technology had survived—and much of it had—had thereby proven itself the fittest. Further inquiry into the past was of somewhat less than vital concern to men who were surrounded by residues of the techniques of past centuries.

The scientist differed less than might be supposed, for this was an age of experimental science. Joseph Henry was probably America's most distinguished physicist, and certainly its leading electrician. He was born the year Volta introduced the "pile" which we know as the electric battery. Much of what we call the history of electricity was simply its subject matter to Henry. Indeed his general knowledge was of this sort, and he repeatedly demonstrated his ability to delve into the reservoir of obsolete science and technology for useful odds and ends. Similarly, Edison, "the Wizard of Menlo Park," born three years after Morse had astounded the world with his successful electrical transmission of a message from Washington to Baltimore, contained within his own experience much of the history of electrical technology. In this respect the giants of nineteenth century science and technology differed essentially from those of today. Inadvertently and in spite of themselves these men were steeped in the history of technology. This coincidental element is conspicuously lacking in the armory of the engineer today, who, as he plunges on into the unknown future, leaves an almost equally unknown past behind him.

Need for a History

Is he the worse off for that? We know that history is essential to the advance of such studies as economics and sociology, but technological

knowledge is peculiarly cumulative, because of its basis in experience and in the techniques of mathematical verification adopted from science. On the other hand, the experience of the technologist who would be an inventor, innovator, or creative designer, must be active, and it is doubtful that many, if any, today could match Henry's ability to reach into the reservoir of experience for useful odds and ends. The volume of technological experience is just too great, much of it too remote, and the demands of the present are too pressing. The results of experimental investigation accumulate in records which lie like sedimentary deposits at ever increasing depths on our library shelves, as effectively lost as are the old machines fed into the blast furnace as scrap. It is a commonplace observation that technology has grown to the point that no single individual can comprehend its breadth. It is less frequently noted that the same condition exists with regard to its depth.

However many useful odds and ends may be buried in this repository of past technology, we are confident that experience has winnowed out the best, and upon that we base the practice of today. But this judgment, too, must be qualified. This experience is not our own; it is the experience of another generation, filtered through the minds of those who have written our textbooks. Unlike the engineer of the last century, we begin our training, and rest our work, upon a basis of knowledge much of which is outside our own experience. That this knowledge is reliable is undoubtedly more probable than are the established doctrines of most other fields, but it is a difference of degree, not of kind. The literature searches of experimenters are not equivalent to the experiences of such as Henry and Edison, and one occasionally notices today a circular tendency in research, in which certain lines of investigation are taken up, pushed vigorously for a time, and dropped, only to reappear after a sufficient lapse of time to have become forgotten.[2]

Finally, much of our confidence in the engineering of today is justified by its increasingly scientific and less empirical character. Yet in science, which has been studied historically more than has technology, it appears that scientific thought and mathematical verification have occasionally been applied in support of wrong conclusions. Such, at least, is a conspicuous inference to be drawn from the works of recent authorities who have written of "The Copernican Revolution," in astronomy, described eighteenth century chemistry as "The Chemical Revolution," and recounted the revolution in late nineteenth century physics.[3]

The view of technological knowledge as cumulative must therefore be modified out of consideration for the changes which the past century has brought in the volume of its accumulated experience, the indirect way in which it is is presented to the contemporary engineer, and the fact that science is only a relatively and not absolutely reliable support. These qualifications derive from the fact that the experience and measured experiment upon which engineering and science

[2] Howard Chapelle, Curator of Transportation at the U. S. National Museum, and a long-time student of ship design, has noted this phenomenon in a number of instances, such as cycloidal and jet propulsion, and hull design. Verbal communication.

[3] Thomas Kuhn, *The Copernican Revolution* (Cambridge, Mass., 1957); reference to "the chemical revolution" is commonplace; one of its early appearances was in M. Berthelot, *La Revolution chimique-Lavoisier* (Paris, 1890); A. R. Hall has recently made a synthesis of these revolutions in his *The Scientific Revolution* (London 1954); Louis De Broglie's *The Revolution in Physics* appeared in an English edition in London, 1954.

are based are not themselves set in bed rock, but in the quicksands of the human mind. Unlike the politician, or at least to an infinitely greater degree, the engineer can settle controversies by experiement and measurement. But the human element, as we call it, enters into the decision as to what experiments will be made, into the reading of the measurements, and into their interpretation. A far greater intrusion of the human element has occurred in many of the greatest accomplishments of engineers, as of scientists, which have been made in the face of the considered negative judgment—I won't call it disapproval—of the majority of their peers. Lord Halsbury of the British National Research Development Corporation has recently remarked that, "Inasmuch as we are what we are in the material sense entirely by virtue of inventions, it is surprising how little objective study we give to the mentality and career of inventors." [4] It is the more surprising if one considers our dependence upon continuous invention. A century ago society was probably still sufficiently independent of technology to regard the inventor as a sometimes useful, but more often amusing and somewhat superfluous member of society. Today the maintenance of our way of life, and perhaps even more fundamental considerations, depend upon continuous invention and innovation. Yet it is just this familiarity with the way in which discoveries and inventions came about, with the human element in the inventive process, which the accumulation and quantification of technology has submerged. This is the principal concern of the history of technology.

In recent years considerable interest in the history of technology has emerged, chiefly among historians, economists, and sociologists. If, as I have suggested, this subject has potential rewards for enginers, some more direct participation from that source would seem to be warranted. The textbook problem has been considerably improved, thanks to Professors Usher at Harvard, Kirby at Yale, and Sir Charles Singer and his colleagues in England, among others. But their works have perforce been written without the support of an adequate background of research on special topics. The achievment of more than a refreshingly non-mathematical interlude in the career of the engineering student would seem to depend on a more extensive enterprise than the mere installation of a course called "The History of Engineering." The real fruit of this field will only be harvested through the systematic analysis of the technological activity of the past, and through even more laborious and difficult studies of the processes of invention and innovation. It seems likely that it can only be achieved by investigators having some degree of specialization and considerable autonomy in research.

It would be somewhat utopian to contemplate at this time the semi-departmental organization which this implies. But these conditions do exist, or should, in the technical museum, the functioning of which requires a staff of specialists differing from those of the university in their common concern with history. Like the university teacher they live by teaching and research. It can be expected that this group will, should the demand arise, serve as a center for research and synthesis in this special field. I have tried to suggest here that it is to the engineer's interest to create such a demand.

[4] *Discovery*, 19 (1958), p. 153.

TEACHING POSITIONS AVAILABLE

MECHANICAL ENGINEERING AND Nuclear Engineering. Mechanical Engineer needed with interest and experience suitable for teaching machine design. Nuclear engineer needed to teach reactor science and engineering. Doctor's degree preferred for both positions. Rank and salary commensurate with education and experience. Apply to Dean E. C. Easton, College of Engineering, Rutgers University, New Brunswick, N. J.

CHEMICAL ENG. TEACHING, RESearch Broad-gage Ph.D. needed for year-around position. Teaching: primarily graduate courses. Research: opportunity to do basic work in several fields, consult frequently on sponsored projects and develop own field of research. Unusual opportunity to build reputation. Attractive salary.
Apply: R. T. Ellington, Chairman, Educ. Prog., Institute Gas Technology, Chicago 16, Ill.

ASSOCIATE PROFESSOR OF ELECtrical Engineering—to teach and supervise research in Division of Engineering Research and Development effective September, 1959. Ten month basis. Ph.D. required or essentially completed. Write Head, Department of Electrical Engineering University of Rhode Island, Kingston, Rhode Island.

ELECTRICAL ENGINEERING DEpartment Head. Excellent opportunity available for young teacher with Ph.D. Should have teaching and industrial experience. College located in San Francisco Bay Area, electronics industry research, development and manufacturing center. Academic rank and salary open. Write to N. O. Gunderson, Head, Division of Engineering, San Jose State College, San Jose 14, California.

AERONAUTICAL ENGINEERING: Applications are being received for two permanent positions in the Department of Aeronautical Engineering at the University of Alabama. Applicants for one position should have advanced degrees. The other opening could be filled by a person holding only a Bachelor's degree if he were to show promise of becoming a successful teacher. Opportunities for consulting and research are available; both are encouraged. A person who has earned a Ph.D. within recent years would sense an unusually attractive opportunity to develop a graduate program and teach in his chosen field. Salaries depend on qualifications—up to $9,000 for nine months for a professor. Usual academic tenure regulations apply; the University contributes toward retirement and insurance. Please address inquiries to: Colgan H. Bryan, Head, Department of Aeronautical Engineering, P. O. Box 1461, University, Alabama.

QUALIFIED ENGINEERS, INTERested in teaching in a new and rapidly growing California State College, are invited to make inquiries. Electronic, Mechanical, Industrial and Aeronautical Engineers, and others, will find a choice suburban location and ideal Southern California climate appealing. This is an opportunity to help prepare the first graduating class, in a school which will retain much of the practical outlook of traditional Engineering Schools. Industrial experience important. Good salary schedule. Address: Dean of Engineering; California State Polytechnic College; Pomona, California.

MECHANICAL ENGINEERING—ASsistant or Associate Professor. Master's Degree required, Ph.D. desirable. Rank and salary commensurate with qualifications and experience. Old established Southern University, with expanding School of Engineering. Undergraduate and Graduate teaching, with opportunity for directing graduate and research work for right man. Write to Professor Fred Morse, Chairman, Department of Mechanical Engineering, University of Virginia, University, Virginia.

TEACHING VACANCY, SEPTEMBER 1959: Young electrical engineer with at least Master's degree; appropriate salary and rank. Write Dean, Norwich University, Northfield, Vermont.

THE UTILIZATION PROGRAM OF THE PRESIDENT'S COMMITTEE ON SCIENTISTS AND ENGINEERS

WILLIAM G. TORPEY

Consultant, President's Committee on Scientists and Engineers, Washington, D. C.

The Problem

Numerous key officials in industry, government, and education have stressed that positive steps to obtain maximum utilization of currently available scientists and engineers offer almost the only immediate solution to the problem of the national demand for scientists and engineers. Many statements suggest that hoarding of such personnel, malutilization practices, and lack of appreciation of the values of effective utilization prevail in areas of both industry and government. It has been stated, for example, that if we, as a nation, could improve the utilization of our current supply of scientists and engineers by only 5 per cent, we would thereby add to the effective professional force as much as all the college graduates who will complete their training in one year.

The term "utilization" does not embrace merely a single specialized type of industrial or agency effort. Rather, utilization refers to the sum total of several personnel activities. Thus, opportunities for advancement as scientists and engineers; the elimination of routine, non-challenging assignments; training opportunities; recognition of the professional atmosphere under which the scientist and engineer thrives best; incentive systems; the breadth of employee services—these items are among the components which make up the area to be investigated through utilization surveys. A study of the utilization of scientists and engineers requires consideration of the whole range of key administrative and personnel functions in an organization.

In numerous cases, companies and agencies must realize that demands for scientists and engineers necessitate full awareness of the utilization problem; no organization can remain lethargic to the present situation; all levels of supervision, as well as scientists and engineers themselves, must examine the extent of utilization of the present supply. It must be noted, too, that individual work situations call for the application of appropriate methods; soul searching by supervisors and others should result in appreciation of the need for selection of pertinent techniques from a wide available range.

It appears that positive results will accrue through spotlighting, at all levels of management, the importance of effective utilization; through pointing out specific beneficial utilization practices in particular situations; and through explaining how individual companies and agencies can adapt such practices to their organizations if they so desire.

The President's Committee on Scientists and Engineers

In 1956, President Eisenhower established the President's Committee on Scientists and Engineers (initially called the National Committee for the Development of Scientists and Engineers) to coordinate and stimu-

late the nation's efforts to meet growing needs for scientific and engineering manpower. The membership of the Committee is drawn from major citizens' organizations concerned with the education, training, and utilization of scientific and engineering personnel. The ASEE is a member. Dr. Howard Bevis, President Emeritus of Ohio State University, was selected by the President to be Chairman of the Committee.

The President has set forth basic responsibilities for the Committee. Specifically, the President has requested the Committee—

1. To assist the Federal Government in identifying the problems associated with the development of more highly qualified scientists and engineers.
2. To enlist the cooperation of all interested individuals and groups in analyzing the problem and developing programs to deal with it, and to take the lead in coordination of interested organizations outside the Federal Government.
3. To make available to all interested organizations information on effective ways of overcoming the obstacles to the training of more qualified scientists and engineers.
4. To publicize the problem and possible solutions in order to stimulate widespread public understanding and support.

In its efforts to carry out its responsibilities, the President's Committee has placed major emphasis on the stimulation of community action across the nation to:

1. Make maximum effective use of our existing supply of scientists and engineers,
2. Encourage the training and use of technicians to release scarce professionals from routine duties,
3. Gather more adequate data on supply and demand of technical manpower,
4. Strengthen scientific and mathematics education in the elementary and secondary schools,
5. Motivate increasing numbers of our talented young people to enter the fields of science and engineering,
6. Increase public understanding of the importance to America's future of an adequate supply of scientific manpower.

As Dr. Bevis said in a communication to President Eisenhower, the Committee believes that the American people have not grasped the full implication of recent technological developments. Such steps as the successful release of atomic energy approximately thirteen years ago, the launching of man-made satellites, and exciting advances toward unravelling the mysteries of life itself are dramatic symbols of the new scientific revolution which is reshaping the world.

The rate of Soviet progress in most scientific fields is so rapid, Dr. Bevis has stated, that unless we broaden and strentghen our own efforts, there is little question of Soviet superiority five to ten years from now. The President's Committee is perturbed lest our major response be to meet purely military needs, for Russian advances in other technological fields present an equally grave threat to the ultimate security and well-being of our people, Dr. Bevis reported. The President has declared that Russia's lead over the United States in training scientists and engineers is a most critical problem facing the American people. This has been a chief concern of the Committee throughout its existence.

The Utilization Conference Concept

One important phase of the total program of the President's Committee

is the utilization conference program. At the March, 1957, meeting of the President's Committee, a recommendation was made to the Committee that a project to improve the utilization of scientists and engineers was feasible and desirable and that a Task Force should be authorized to effectuate an action program in this area. The recommendation was unanimously approved by the full Committee, and the Task Force on Utilization was set up. Subsequently, the Task Force adopted a program calling for a series of local utilization conferences to be held throughout the United States.

The pattern subsequently evolved as a guide for such conferences is based upon certain principles: (1) the conferences are local in character and are sponsored by local organizations that are vitally interested in the engineering and science fields, (2) the planning group is representative of key groups directly concerned with scientific and engineering personnel in the area, (3) conferences are directed at policy makers as well as supervisors of engineers and personnel managers, (4) topics covered should be of such a nature that conferees may take specific action to improve the effectiveness of their own organization, (5) depth of program content leading to subsequent action by individual companies and agencies, instead of breadth of coverage, is considered more desirable, (6) the groups sponsoring the conference determine responsibilities for conference management, according to local needs and resources, (7) conferences are usually 1½ days in length, featuring an opening general meeting with keynoters, a series of concurrent panel sessions, one or two luncheon sessions, a banquet session, and a closing general meeting (including a resume of conference ideas).

The Local Conference Program

The Task Force desired to have the conference pattern tested first by a few local groups. Contact was made with deans of engineering and state officials of the National Society of Professional Engineers and, subsequently, the decision was made by four local groups to hold pilot conferences at Charleston, West Virginia; Houston, Texas; Boston, Massachusetts; and Denver, Colorado. In each instance, a staff member of the President's Committee, upon specific requests of the local planning group, met with the local planning group to render assistance. Services rendered included detailed suggestions for conference management and for content for the program, obtaining of key speakers, addressing the conference itself, participating in panel groups at the conference, and assisting in the development of follow-up plans.

An evaluation of the pilot conferences was made in November, and it was decided that the use of the conference technique by other local groups should be encouraged. As a result of the enthusiasm and apparent success of the four pilot conferences, 15 additional conferences, to constitute the second series, have been held between December, 1957, and November, 1958. These conferences have been held at the following locations: Charleston, West Virginia; Houston, Texas; Boston, Massachusetts; Denver, Colorado; Columbia, Missouri; Los Angeles, California; Des Moines, Iowa; Omaha, Nebraska; Lafayette, Indiana; New Brunswick, New Jersey; Atlanta, Georgia; Bozeman, Montana; Troy, New York; Minneapolis, Minnesota; East Lansing, Michigan; Peoria, Illinois; Philadelphia, Pennsylvania; Milwaukee, Wis. and Dallas, Texas. One characteristic of the second series of conferences has been the multiplicity of professional and industrial or-

ganizations and of academic institutions as local conference sponsors.

The President's Committee does not consider the specific number of persons in attendance to be the sole determinant of the success of the conference; rather, the quality of the program and the enthusiasm of the participants to consider the application of conference material to their own companies are more fundamental to the conference planners. However, attendance at local conferences has usually exceeded local expectations. Average attendance has ranged from 100 to 150 participants. The largest attendance was 343, at Omaha, Nebraska. On the other hand, one of the outstanding conferences was held on the Purdue University campus, with approximately 50 persons in attendance: conference planners at Purdue reported that the conference was very well received and that many participants said it was worth several times the expense and time away from their jobs. Representatives of large and small companies and government agencies have participated in the conferences. The majority of the conferees have been from top or middle management.

Active assistance in the program has been, and is being, furnished by the Executive Director of the National Society of Professional Engineers, the Executive Secretary of the Engineering Manpower Commission, and the Executive Secretary of the Scientific Manpower Commission.

Local planning committees have felt that publication of a proceedings or a resume of conference highlights has at least two basic values. The proceedings serves as a review device for those who attended. The proceedings also contains very practical information for employers who were unable at attend a particular conference. Local planning committees give a copy of the proceedings to conference registrants, but normally make available copies to others for a fee. Several planning committees have reported a brisk sale of their proceedings to employers scattered throughout the United States.

A follow-up plan has been adopted by local planning committees in an effort to gauge the effectiveness of the conference, as well as to provide further help to the participants. Questions to be included on a follow-up questionnaire are, of course, matters for decision by a local planning committee. However, the usual follow-up questionnaire has two parts. Part I consists essentially of a series of questions related to conferee opinions on the format, mechanics and general value of the conference. Part II comprises a list of positive policies and procedures promoting better utilization which have actually been developed during the conference itself, with the list arranged to solicit participant response concerning follow-through on each item. Whereas the proceedings reflect the flavor of the discussions by the several speakers, Part II of the follow-up questionnaire presents specific policies and practices, in summary form, as a list against which participants check their own company or agency practices. The follow-up not only serves as a reminder of helpful techniques reviewed at the conference, but it also elicits information from employers about particular policies and practices they follow which may be useful elsewhere.

Some Preliminary Results

An essential feature of each conference has been the expressed feeling, on the part of conferees during the conference, that, as a result of their participation, they will evaluate policies and practices of their organizations with the objective of improv-

ing the utilization of their professional personnel. For example, at conferences:

1. A number of employer representatives have stated that greater stress will be given to company and university-sponsored training programs. Several firms intend to consider the possibility of paying tuition costs for those employees who are interested in studying for advanced degrees.

2. A number of industrialists have indicated they will appraise their incentive systems for scientists and engineers with the view toward making such systems more equitable and effective.

3. Attractive environmental features have been thoroughly discussed. Some company representatives intend to investigate the possibilities of improving their personnel programs through (a) encouraging their scientists and engineers to attend professional society meetings and to prepare and publish papers in their specialty, and (b) providing more stimulating work experience through a variation of professional assignment.

4. The importance of the quality factor of first-line supervision of scientists and engineers has been emphasized. Certain conferees have indicated, for example, they will reexamine their supervisory selection method.

5. Salary has been discussed and a number of firms have decided to explore the possibility of establishing parallel pay structures for those scientists and engineers who are not interested in administrative work so that they—as well as those who do desire administrative duties—may progress financially in their profession.

6. Conferees have been impressed by the desirability of greater utilization of technicians on the engineering and scientific team. Many representatives indicated they would look into the ways and means of increasing the use of technicians.

Information indicates that conferees are carefully "following through" as they had planned. For example, the initial follow-up conducted by the West Virginia Utilization Conference Planning Committee revealed that 71 out of 80 respondents replied that they had reviewed, against their organizations' policies and practices with respect to the utilization of engineers and scientists, suggestions made at the conference for improved utilization. Fifteen out of 71 respondents replied that they had—within a matter of a few months—already made changes in the policies or practices of their organization with respect to the utilization of engineers and scientists as a result of the conference; an additional significant number of respondents indicated they were seriously considering the application of conference points to their organizations. It may be interesting to note that 65 out of 86 respondents stated that their general impression of the entire West Viriginia conference was either "excellent" or "very good," that 62 out of 75 replied that they think that benefits could be derived from another utilization conference to be held, they suggested, in approximately one year from the first conference, and 21 out of 58 stated that their organization has particular policies or practices promoting better utilization of enginers and scientists which they think might be useful in other organizations. Viewed as a whole, the written comments made on the West Virginia Planning Committee questionnaire objectively indicate that the local utilization conference was not only well worth while, but that significant positive follow-through has occurred in individual companies and agencies.

Written evidence obtained by various planning committees during the follow-up indicates (1) that many companies and agencies are seriously considering recommendations made during the utilization conference from the viewpoint of application and (2) that specific changes have been made in policies and practices of particular organizations, with respect to the utilization of engineers and scientists, as a result of the conference. Companies and agencies have reported, for example, that as a result of the conference they have:

- —delegated non-professional duties to technicians and to clerical employees
- —trained technicians
- —recruited more technicians
- —set up a program of equitable recognition
- —given greater voice in management to scientists and engineers
- —outlined specific duties of professional personnel
- —revised the interviewing system for professional personnel
- —provided in-service training
- —transferred qualified engineers from drafting board operations to professional tasks
- —reassigned engineering personnel, after special training, to group supervisor responsibilities
- —initiated individual studies toward improved utilization
- —made an evaluation of the entire utilization sphere as related to a particular organization.

Other conferees have written to planning committees that conference utilization points have backed up company policies which they have instituted.

A Look Ahead

The subject of recruitment is distinct from the conference program. Statements are sometimes made that, in view of a temporary recession in a particular geographical area, individuals see no value in holding or attending a utilization conference. The concept of utilization as developed through the conference program is to stress those policies and procedures directly concerned with conserving scientific and engineering manpower. The conferences aim to induce the best creative and productive professional effort on the part of scientists and engineers. The President's Committee believes that striving for maximum utilization of such personnel is a matter of effective manpower management and is simply "good business" anywhere, at any time, whether or not one or more companies in an area are presently recruiting or not recruiting scientists and engineers. An examination of the programs of local utilization conferences already held under the auspices of the President's Committee reveals that recruitment as such has not been featured at any conference. Utilization conferences are really independent of the question of any temporary recession. A recession underscores the need for taking appropriate steps to assure that professional personnel are creatively and productively engaged.

Currently, decisions have been made by fourteen other local groups to hold local conferences within the next few months. These conferences will probably be held in the following cities: San Diego, California; Hartford, Connecticut; Dallas, Texas; Cleveland, Ohio; Raleigh, North Carolina; Wichita, Kansas; Orlando, Florida; Washington, D. C.; Tuscaloosa, Alabama; Kansas City, Missouri; Syracuse, New York; Buffalo, New York; Columbus, Ohio; Knoxville, Tennessee; and San Francisco, California. In addition to the locations enumerated

above, active consideration is now being given by ten additional local groups, with indications that several more similar conferences would probably be held during 1959. Several requests for further information with respect to the planning and administration of additional conferences have also been received by the President's Committee. Furthermore, several local planning committees which have already held a utilization conference under the auspices of the President's Committee are now actively planning a second conference to be held in 1959.

Through the utilization conference program, the President's Committee believes that significant progress is being made, in a realistic way, to improve the conservation of scientific and engineering manpower.

ENGINEERING STUDENTS TEACH HIGH SCHOOL

College Notes

The establishment of the Honor Service Teaching Appointment program has been announced jointly by the Philadelphia Board of Education and Drexel Institute of Technology. Upper class Drexel engineering students, enrolled in the five-year cooperative education program, will serve as auxiliary substitute teachers in Philadelphia high schools, teaching science and mathematics courses. At least 15 students are in teaching positions in the fall term, their assignments lasting until January 1 when they will be replaced by other Drexel cooperative engineering students.

The program marks the first time that Drexel cooperative engineering students are being used as teachers in the Philadelphia school system. The dual purpose of the program is to satisfy the ever-present teaching shortage while making available to the high school students a level of instruction in the vital subjects of mathematics and science based on rigid collegiate training. The student-teachers have been selected by means of a careful screening program, with outstanding scholarship and leadership qualities being the main criteria.

The cooperative program has been in effect at Drexel since 1919. Under the system, students alternate periods of classroom study with work assignments in business and industry. Some 500 firms in the metropolitan Philadelphia area regularly employ Drexel students.

CANDID COMMENTS

ON TEACHERS' SALARIES

SAMUEL B. FOLK

Professor of Engineering Mechanics
The Ohio State University

Professors F. L. Foster and T. W. Harrington, Jr. of Massachusetts Institute of Technology should receive an award for their "Engineering Teaching and Research Salaries Versus Industrial Salaries" (JOURNAL, April 1958). While they have fallen into the trap of comparing monthly teaching salaries with industrial salaries, yet they have recognized that

> When comparing these faculty salaries with the industrial research salaries, it must not be forgotten that the faculty personnel receive their rate for only nine months, while research people are paid at their rates for twelve months.

The "Salary Structure" shown in their Table 1 brings out the basic annual rates which is the only true comparison of salaries. The inconsistency of not using an annual base shows up when the teacher's salary is multiplied by 12/9 while the university researcher is not multiplied by 12/11 even when he gets a month's vacation.

It is unfortunate that the ASEE Committee on Development of Engineering Faculties (JOURNAL, May 1958) used average monthly salaries of teachers for comparison with estimated salary levels to be competitive with non-teaching opportunities although industrial salaries were not actually listed alongside.

The same 12/9 multiplier was used on faculty salaries in the 1955 report of the ASCE Committee on Salaries (*Civil Engineering*, August 1955) although when challenged by the writer (*Civil Engineering*, December 1955) the committee chairman admitted that this method of comparison was misleading.

But most serious of all is the conclusion which the public draws from reading statistics of monthly salaries of engineering teachers and mentally multiplying them by 12 months. An instructor at $500 a month appears to be doing as well as a young graduate on his first job at $500 a month in industry. *We* know that the industrialist gets 33 per cent more pay each year but our figures fail to convince the public or the legislators. Engineers ought to be the last to confuse rates of pay with total annual salary. Coal miners are an example of high wage rates and small number of working days per year. But public school teachers' salaries are usually quoted on an annual basis.

The original philosophy in setting salary scales for university teachers was to pay enough so that they could afford to study during the summer and thereby enhance their intellectual development for the advantage of the institution, their students and the public welfare. But salaries have failed to keep up with the cost of living (to say nothing about sharing in the 3 per cent annual increase in national productivity), with the result that many teachers now hold menial summer jobs. The seriousness is evident when one notes that real personal income, per capita, in the entire United States is now 79 per cent above 1939 while for instructors the increase is practically at zero (*Bull. Am. Assn. Univ. Profs.*, Spring 1958).

If we present our wealth of statis-

tics in a more convincing manner, we have a better chance of getting recognition. Moreover, we should set our sights high enough to be sure of attracting the kind of personnel the universities need. This means proposing a salary scale for engineering teachers which is higher than that for most other university departments. The courage of our convictions should logically follow our engineering estimates.

HISTORY OF SCIENCE AND TECHNOLOGY

College Notes

At Case Institute of Technology in Cleveland, a new course being offered for the first time this year to seniors in the Engineering Administration curriculum will be the History of Science and Technology. This required course will be taught by Dr. Melvin Kranzberg, Professor of History, whose efforts led to the establishment of the first center for the study of Technology and Science at Case.

The course is the first attempt to completely integrate the historical backgrounds of science and technology into one comprehensive study. Future courses dealing with the impact of technology on society will be added to the curriculum.

NEW METALLURGY BUILDING AT COLORADO MINES

College Notes

One of the nation's most complete engineering classroom and laboratory buildings silently went into operation on September 10 when the fall semester began at the Colorado School of Mines. The one-million-dollar metallurgical engineering building, termed the "finest academic building for metallurgy anywhere in the country" by Mines Metallurgy Department Head H. Gordon Poole, was placed in operation without a formal dedication ceremony.

The structure will house the entire metallurgy option taught at the mineral engineering college. Nearly 250 metallurgy students, triple the enrollment of five years ago, will call the new building their academic home.

The new facility was constructed on building mill levy funds, a source of revenue granted by the State of Colorado for construction and maintenance of academic facilities. Total construction and equipage costs for the building ran just under one million dollars.

THE PLACE OF THE JUNIOR COLLEGE IN ENGINEERING EDUCATION

KENNETH BARNES

Head, Engineering Department
Southern State College, Magnolia, Arkansas

Recommended by the YETs

For the past seven or eight years, many people in a position to know have had a definite concern over the shortage of engineers. This shortage is extremely serious in view of our very technical economy and our national security.

Many reasons have been advanced for this "shortage" of engineers. Among these reasons are (1) the lack of college engineering teaching facilities; (2) the inadequate background of secondary-school students; (3) the use of engineering school facilities for students who are not mentally or psychologically suited to becoming engineers; and (4) the difficulty of engineering courses.

Virtually the only step that colleges have recently taken to alleviate the problem is to increase their physical plants for training in engineering. One of the most sadly overlooked potential means of solving all four of the above difficulties is the junior college, which, if properly used, could satisfy all the requirements of the freshman and sophomore engineering curriculums.

The first obstacle to be overcome regarding the use of junior colleges is the antagonistic attitude and antipathy of senior college personnel toward the junior colleges. However, if properly approached, a senior college instructor would realize the benefits to his school from the proper instruction of students in junior colleges. Let us consider these items, and what the junior college could do with them.

(1) *The lack of college engineering teaching facilities.* Though freshman and sophomore engineers do not use a large percentage of the instructors or facilities of an engineering college, there are large amounts of time and facilities that go into the basic graphic, problems, mechanics, and specialized courses in the first two years. There is an enormous amount of counseling to be done. The release of the engineering faculty from these obligations would allow greater and better use of time and facilities for junior and senior students.

(2) *The inadequate background of secondary school students.* In many parts of the country, especially in the area of the small high school, this is a very serious problem. In our own school, 60 per cent of our entering freshmen do not have adequate background for taking college algebra or trigonometry. Therefore, they are compelled to take as much as nine semester hours of mathematics before they can enroll in analytical geometry, which leading colleges are now requiring of their freshman engineers. These students do not mind taking such courses, for which no credit is given, if the reason is explained. Furthermore, they should not be forced to give up an engineering future because of lack of adequate secondary-school background. An equally important factor is that 65 per cent of our students have not had high school chemistry and 85 per cent have not had high school physics. Instructors in a junior college would have the necessary time to spend with students of this inadequate background with-

out impairing the instructor's duties to his junior and senior students.

(3) *The use of engineering school facilities for students who are not mentally or psychologically suited to be engineers.* Not only is this a major problem for engineering schools, but of all colleges. What better place has the four-year engineering school to do its "dirty wash" of removing these inadequate students than the junior college.

(4) *The difficulty of engineering courses.* Though junior colleges cannot make the course easier, the difficulty as related to an individual student can be approached at an early stage and the remedial work given. This remedial work has proven more efficient when given to students in smaller classes, with more individual attention, with instructors who do not have to teach the heavier, advanced subjects, and in "small" college atmosphere.

The advantages of a junior college are many. Our present day students that graduate from secondary schools are young (16–17) and immature. There are few places in the United States, if any, that are not within commuting distance of a junior college. On the other hand, there are many places that are not within commuting distance of an engineering school. Thus, the young and immature student can attend a junior college and still have parental guidance. In addition, the junior college is usually more economical than a larger, four-year engineering school.

With an anticipated 500,000 student enrollment in engineering in 1970 as compared with our 270,000 now, the role of the junior college in taking some of this increase is inevitable.

It is now time to consider a program that should be followed to make the junior college freshman and sophomore work more satisfactory and better accepted in senior college work. Some of the items that readily come to mind are:

1. To educate the personnel of the senior colleges that such a plan is satisfactory.
2. To develop standards for junior college work.
3. To establish a method for checking and rating the various junior colleges with respect to engineering. Sub-committees of existing accreditation organizations and committees should be worked into this since the standards should be related to both the junior colleges' general accreditation and the senior colleges' engineering accreditation.
4. To establish a distinct engineering personnel and an engineering advisor in each junior college. The lack of knowledge of engineering of the non-engineering educator is amazing to the writer. This is a serious problem in all colleges and one of the reasons there is a shortage of engineers in our country today. The writer has battled counselors who have the idea that only "A" students can make engineers.
5. To correlate the work of the sophomore year throughout the United States. The prime example of this lack of correlation is mechanics. The recent report of G. Wallace Smith in the JOURNAL OF ENGINEERING EDUCATION, March 1956, shows that some schools begin Statics in the second semester of the freshman year, while others begin as late as the second semester of the sophomore year.

Some schools teach a three-hour course in Statics and a three-hour course in Dynamics; other schools give one three-hour course covering both subjects; and some offer a five-hour course covering both subjects. Therefore, this uncorrelated situation

is extremely discouraging to a junior college administrator in setting up the mechanics courses of a junior college which must meet the standard of the various senior colleges which his students will later attend.

The senior engineering school to which a student will transfer should have partial voice in his first two years. All of the junior college student's attention should be directed toward his curriculum for the last two years. The administration of a junior college program must be under the hand of an educator who understands engineering, senior engineering college problems, problems of other departments of his college, and secondary school problems. He definitely should be an engineer with a graduate degree or equivalent. The administration should be with his own college, but with definite co-operation between the senior colleges to which the students will later transfer.

In the present day engineering curricula there are few, if any, electives left for the engineer. These electives should be left to the senior college for the purpose of strengthening the weak points of the student's background and education. Therefore, this limits the problem of junior college courses to be offered. However it can be shown that the student can secure about 50 per cent of his engineering work at the junior college.

To summarize:

1. The junior college has a definite place in endeavoring to overcome the drastic shortage of engineers in the United States.
2. It is not the purpose of the junior college to take the students from the senior college, but to alleviate the crowded conditions of the senior colleges which now exist and those expected to exist in the future.
3. The junior college curricula and courses should be rigidly standardized as far as quality is concerned.
4. Junior colleges should not encroach upon any courses at the junior and senior classification.
5. Senior colleges should respect the students and the opinions from the junior colleges.
6. A much closer relationship between junior colleges and senior colleges should exist.

COLLEGE-INDUSTRY CONFERENCE

The Eleventh Annual College-Industry Conference will be held at the University of Houston on January 26–27, 1959. The theme of the meeting will be "Industry Speaks Its Mind on Engineering Education." Sponsors of the meeting will be the Southwest Section of the Relations With Industry Division of ASEE, the University of Houston, and the Engineering Colleges of the Southwest. For information, write RWI Chairman Ralph A. Emerson, Industrial Relations Supervisor, E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Delaware.

CANDID COMMENTS

THINK TWICE!

From an ASEE member.

Many references are made in the JOURNAL about engineering faculty members being lured into industry by higher salaries. What has been the feeling of these engineering teachers one, two or three years after the change has been made? I spent a number of years on an engineering faculty and then went into a defense industry, and here are some of my reflections.

First comes the feeling of being "restricted." You enter or leave through gates policed with armed guards, presenting your badge. Woe betide you if you have forgotten it! Then you look out through your office window (if there are any, and many buildings are windowless) and you see the ten foot steel fence topped with barbed or electrified wire—a far cry from the open campus with trees and flowers! You wonder just how many years you can stand these prison-like enclosures.

At the university you perhaps shared an office with two or three faculty members, or maybe you rated a private office. Concentration on a problem is not easy with group discussions going on around you in the "bull pen" with from fifty to five hundred engineers and draftsmen. Add to this phones ringing, general traffic past your desk, and visitors from other departments. After a few weeks of this, you feel that you should have your head examined for ever having considered giving up your teaching position.

At the university or state college you had the feeling of satisfaction from your direct contribution to engineering in preparing our future engineers for their life work. The teaching methods or aids which you devised could be quickly evaluated by *you* as to their effectiveness—a direct analysis, involving no "red tape." Perhaps a change of emphasis in course content was indicated—the change is made—no bother. Now ideas which you originate must be passed on by many persons, some are incompetent, none have a personal interest. These delays are frustrating and are not confined to design work. They extend into purchasing of simple hardware items—a dollar spool of solder requires 17 signatures before the order can be placed and three weeks are required to process it.

You may feel that the greatest loss of all is the lack of freedom of hours. Although the 8 to 5 routine in the factory may mean less hours than your normal day at the university, still there was a flexibility. If you had no afternoon classes, no strain about taking off, and grading papers that night and preparing for the next day. Any such "afternoons off" are out of the question here.

No matter how liberal the vacation plan of the corporation is, you'll not get those helpful breaks at Thanksgiving, Christmas and between semesters.

Income? Well, perhaps it is greater. But don't forget to figure the extra income tax "bite." Frequently the industrial area into which you have to move means a higher cost of living. Transportation to and from work may be costly in time and money. Perhaps you did consulting work, this income is cut off.

So, if you love teaching and are tempted to go into industry, think twice before you move!

A "PHILOSOPHY" MINOR FOR ENGINEERS

JOHN A. BISHOP

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Newark College of Engineering, Newark 2, New Jersey

Over a long period of time (too long) the author has observed the repeated discussions about the place of subjects other than "engineering" in the engineering curriculum. At practically every annual and sectional meeting, someone from an English or history department will give an impassioned speech about the cultural lack of the engineer. Agreement will be heard from the *older* practising engineers and industrial executives, particularly those who have attained such eminence and leisure that their wives now take them to the opera, ballet, and so on, impressing on them thereby that they are lacking in "culture."

One trouble with these diatribes lies in the fact that they are never implemented with a definite curriculum planned to accomplish this aim of uplifting the engineer. Every engineering school has "cultural electives" which usually have no sequence, and which definitely have no inter-relationship. This paper is designed, by contrast, to offer a planned set of courses which, if taken in sequence, should leave the engineer with a background of knowledge in history, literature, and the arts, capped by a summation of all these in the senior philosophy course.

As a graduate of a liberal arts college who is teaching analytical chemistry to engineers, the author is well accustomed to being shot at from all sides, the "humanists" claiming he is too practical and the engineers being positive he is too theoretical. From his position between the two he has been able to look back and see the points of view (as well as the weaknesses) of both sides. As a result of these observations, he would like to offer the specific proposals which follow.

The proposed minor is based on a thirty-hour class week, which seems to be what the average engineer carries. It can be seen best as an entity in Table I, about which the discussion is built. The content of each course would be based on the fact that the student had passed the course of the previous year. Suggested material content and time allotment for each course are summarized below.

Freshman Year

English Composition and Speech. A rigorous course emphasizing effective composition and speech in general, not directed towards engineers. Any courses in report writing could be taken out of the engineering sequence of courses, possibly to be given in the junior year. *Eight semester hours.*

History. World history given as a background to the later course in comparative government, with emphasis on the economic and cultural background of modern nations, and showing how these nations evolved to their present status and problems. *Six semester hours.*

Science Background I. This course should be taught after the case method of the law schools, the classical experiments and theories being taken up, their subsequent development and modifications being brought out, and the modern developments which are based upon them pointed out. In the

TABLE I

SCHEDULE FOR FOUR YEARS OF A "PHILOSOPHY" MINOR

Senior year	Philosophy 1 year		
Junior year	Psychology ½ year Logic ½ year	Comparative Government 1 year	Economics ½ year Fine Arts II ½ year
Sophomore year	Literature 1 year	Science Background II 1 year	Fine Arts I ½ year Ethics ½ year
Freshman year	English Comp. & Speech 1 year	Science Background I 1 year	History 1 year

freshman year this course could be based on physical science. Laboratory would repeat the classical experiments, and involve reports and library work. *Two hours of class, two hours of laboratory each semester.*

Sophomore Year

Literature. A survey of the world's great literature—prose, poetry, and drama. In the lectures accompanying the reading, the cultural background of the people from whom this literature evolved should be emphasized. *Laboratory work* in this course would consist in attendance at the theater with subsequent discussions in class of the plays seen. *Six semester hours.*

Science Background II. Treated as in I, but with emphasis on the biological and geological sciences. Emphasis in the biological part could be placed on genetics, including the effects of radiation on tissue and on heredity. Laboratory included as in I. *Two hours of class, two hours of laboratory.*

Ethics (First Semester). Discussion of ethical systems of conduct. *Three class hours.*

Fine Arts I (Second Semester). Music—History and appreciation, *including attendance* at operas and concerts of various types of music. *Three hours of class.*

Junior Year

Psychology (First Semester). Introduction to the principles of psychology—Survey course. *Three hours of class.*

Logic (Second Semester). Principles of logic. Inductive and deductive reasoning. *Three hours of class.*

Comparative Government. The evolution of the various kinds of government which have been used, from the earliest tribal type to those of modern times. Emphasis should be placed on the economic and psychological conditions which produced each type at the time it was in use. Cross-references to conditions producing similar types of government should be made, with an attempt to show how variations in economic or psychological conditions produced variations in government forms. *Six hours of class.*

Fine Arts II (First Semester). Aesthetics. A study of the principles underlying beauty. Examples to be taken from the great works of art, music, and drama, with emphasis on ballet, painting, and sculpture. *Three hours of class.*

Economics (Second Semester). In-

TABLE II

TIME ALLOTMENT, BASED ON A 30-CLASS-HOUR WEEK

	Phil. Minor	Tool Courses	Engineering
Senior	3	—	27
Junior Year	9	—	21
Sophomore Year	10	4	16
Freshman Year	11	11	8

troduction to economics; fundamental principles. *Three hours of class.*

Senior Year

Philosophy. To be given from the historical viewpoint, with the knowledge that the student has had the courses listed for the previous years, and therefore has some background to work on. *Six hours of class.*

Other Subjects

The position of certain other non-engineering subjects has not been designated. These are those which are definitely tools, such as mathematics and drawing and also languages, which are tools for most engineers, but which are fought by the technician type of mentality and which may turn out to be enjoyable for some students. Omitted also is the place of engineering orientation, which seems to be neither cultural nor a direct tool. The content of such tool courses would vary with the previous preparation of the student. A possible time allotment is suggested in Table II.

This schedule leaves open to the engineering departments about as much time as is usually spent in the engineering subjects. It also leaves up to each department the order in which such subjects should be taken. The position of chemistry and physics has not been indicated, since it might be a variable depending on the department. Chemical engineers, for example, might take a standard chemistry course in the freshman year, with physics in the sophomore year; other engineers might take physics in the freshman year, and request a special chemistry course in the sophomore year since they will have had the Science Background I by that time.

The author wishes to emphasize the fact that the sole responsibility for this paper must be placed firmly on his head, and offers it with the belief that engineers who have had such a course should come up to the senior year with a much broader outlook than they have at the present. He also believes that such graduates would come much closer to having an understanding of the non-engineering people with whom they must inevitably deal, both on boards of directors and among the general public.

EJC MEETING IN JANUARY

The 1958 Annual Meeting of Engineers Joint Council is scheduled for January 15–16, 1959 in New York.

ENGINEERING ANALYSIS IN EDUCATION

ERICH A. FARBER

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With so much discussion of scientific education and so many demands for changing it, it is well to stop for a moment and look at the problem. There are some who want to scrap our educational system and replace it with something new and magic which will solve all our problems; however, no one knows exactly what this will be. It is seldom possible to find a system completely right or wrong. The problem is, how to improve our present educational system to obtain satisfactory results.

The writer believes that it is of extreme importance for the student as well as for the teacher to look at problems in their entirety, whether or not scientific, and to have a clear understanding of all the implications, restrictions, and limitations involved. Only after the problem has been carefully scrutinized should an attempt be made to solve it. Then, and only then, a direct approach to or attack on the problem can be plannned.

After this is done, the plan of attack can be carried out either by the person who has made the study, or by a "technician" who is merely told what to do and does not have to understand the problem. He is the manipulator or the calculator who grinds out the answers. As soon as the answer is obtained in this manner, the analyzer takes over again and tries to extract as much information as he can from the data. This, if done well, produces a thorough evaluation of the problem in terms of the results obtained. This complete process is required for an engineering analysis of the problem.

Should this overall approach be taught in separate, new courses, using special problems? The writer believes that every successful and effective teacher uses this method all through his present courses; his students do not get lost, they know what they are driving at, at all times, and enjoy their efforts. They realize how much more they can do than by merely reproducing the manipulations shown or taught them. They do not lose sight of the over-all objective, or lose interest, or fall behind by missing a specific step in the calculations.

In this picture of analysis, mathematics is only a tool, the language of science, and the person using it must know it well. But even more important, he must know what he wants to do with mathematics—requiring again the clear understanding of the problem. Thus, the complete analysis procedure entails the following:

1. A clear understanding of the problem must be developed, possibly, but not necessarily, in words.
2. This picture has then to be translated into mathematical language, obtaining equations (often with restrictions stated as boundary or other conditions) which describe the problem.
3. Next comes the manipulation by which the desired quantity can be extracted from the original mathematical relationships, a quantity which is then referred to as the solution.
4. These steps completed, the most valuable part of this whole effort, the interpretation and evaluation of the results, has to be made. The purpose of the work done so far is to reach this goal.

Not all of these important steps for complete analysis are always taken. Step 1 is often left incomplete, thus leaving a fuzzy picture of the problem. Step 2 is many times eliminated completely and the mathematical "formula" furnished. Step 3, which is really technician's work, is usually over-emphasized and students often learn little beyond grinding out answers. The fourth and last step is often not treated satisfactorily and it seems as if the person having done all this work is now running out of steam even though his goal is in sight.

This conclusion is verified in many laboratory reports, where little discussion and interpretation are found after pages and pages of manipulation. Engineering analysis is a difficult step because it requires the teacher to encourage the student to think. Unfortunately, a large number of our present day courses are set up on a basis where memory is rewarded rather than thought and analysis.

To summarize quickly, the writer feels that every successful teacher of engineering (one who has gone through complete problems in research, consulting or other work) uses analysis in his courses because he recognizes it as being the only effective method applicable to all problems. Such a teacher generally does not believe that it is necessary to set up separate and new courses. It is the writer's conviction that if engineering analysis is used in all, or even in most courses, our enginering graduates, educated in this manner, will be qualified to tackle today's challenging problems.

GOGLIA DEAN AT NOTRE DAME

Dr. Mario J. Goglia has been made dean of the College of Engineering at the University of Notre Dame. Dr. Goglia, who assumed his new duties July 1st, had been serving as Regents' Professor of Mechanical Engineering at the Georgia Institute of Technology, Atlanta. He succeeds Dean Karl E. Schoenherr, who left Notre Dame to become technical director of the hydromechanics laboratory at the Navy's David Taylor Model Basin, Carderock, Maryland.

As specialist in thermodynamics and co-author of a text on the subject, Dr. Goglia joined the Georgia Tech faculty in 1948 after receiving his doctorate from Purdue University. He taught mechanical engineering at Purdue during 1947–48 and at the University of Illinois, Champaign-Urbana, from 1938 to 1946. The 42-year-old engineering educator received the Naval Ordnance Award for his World War II research in the munitions development laboratories at Illinois.

Dean Goglia has been a member of ASEE since 1940.

FOREIGN SUMMER JOBS

A Report on the Operation of the IAESTE

F. R. ERSKINE CROSSLEY

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The student who has lived away from home is usually fairly easy to distinguish from those who never have. A certain air of self-assurance generally develops in them, and savoir faire, too. And by the same token, there accrues a further advantage to those who are able to go abroad. There is great educational opportunity in foreign travel: some like to learn history in guarded, guided groups shepherded through old cities and instructed in the significance of ancient monuments, and there is much merit in this. Others find fascination in meeting and getting to know people, men and women who live differently, in a different mode and with a different tradition, speaking a different tongue. And such travelers come home with a broader mind and an appreciation of viewpoints other than their own.

IAESTE

An organization was started in Europe ten years ago, which recognized that an engineering college student needed to get technical experience through a summertime job in industry, but proposed to arrange that job in a foreign country. So it would kill two birds with one stone. The organization is called IAESTE—The International Association for the Exchange of Students for Technical Experience; it was launched by a conference of men from ten countries, and its basic idea caught hold rapidly. In that first year of operation, nearly a thousand exchanges were arranged between these countries. Since then the number of member countries has increased to twenty-three,* the number of participating universities and technical schools is over four hundred, and for the students nearly six thousand jobs were arranged in the summer of 1957, in countries foreign to each one.

Without implying on my part that I can promise anyone a specific job, there is quite a little glamour to some of the positions that the association has arranged in past years: consider spending a summer high in the Austrian Alps with the Tyrol Waterpower Works, or beside Lake Geneva in Switzerland at Nestlé's canned milk and chocolate plant. Or for those interested in automobiles, there are jobs offered by Armstrong Siddeley or Bristol in England, by Daimler-Benz (home of Mercedes) and Volkswagenwerke in Germany, Renault in France or Fiat in Italy. There are many oil companies and refineries participating, also paper and pulp plants particularly in Scandinavia, big electrical manufacturers such as Siemens, Philips and British Thomson-Houston, municipal power plants, chemical and textile plants, but also hundreds of small places, architects' offices, machine shops, foundries, building constructors, civic boards, mining and quarry-

* Austria, Belgium, Denmark, Finland, France, Germany, Great Britain, Iceland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Yugoslavia, Turkey, Israel, India, Ceylon, Union of South Africa, Canada and the United States.

ing enterprises. In Yugoslavia they are most anxious to invite more foreign students to come to work: living is very cheap and the national committee there has arranged that the foreign trainees can have cheap sojourn in students' camps near the Adriatic Sea. There and in many European countries, students qualify for half-price tickets on the railroads. From Sweden, Germany and Holland come reports of civic receptions by the mayor of the town to groups of students, invitations to hospitality in private homes, and special tours of beauty spots.

Participation

Participation by the United States in this association was endorsed by ASEE three years ago while Dr. Maynard Boring was president, and also by the ASME. A national secretariat was set up and sponsored by the Institute of International Education in New York, the same institute that administers part of the Fulbright program. On many of the campuses of the larger engineering schools a faculty adviser for IAESTE has been appointed.

For a student who wishes to participate, the procedure is simply to apply personally to the IAESTE faculty adviser or the dean of his university,* fill out the proper form, and deposit the registration fee, at present $25, *before January 1.* The adviser or dean is charged with the responsibility of endorsing the applicant in the name of the University, for it is felt especially important that every trainee should be of good character, since in the small community where he (or she) will work each will be regarded as a sort of unofficial ambassador and certainly as a typical example of his countrymen. To be eligible, the student must be in his sophomore year, unless he (or she) shows especial maturity earlier, and he should be majoring in some branch of science or technology, unless he has had previous technical and practical working experience in the type of work for which he is applying. In any case previous practical experience is desirable. A working knowledge of the particular foreign language is usually not demanded, except in Germany, Switzerland and France; however the student is not going to get very far on the road of mutual understanding and personal acquaintance without speaking the local language. A student in his application is only permitted to state in general the type of job that he would like and list the countries to which he wants to go in order of preference.

The reason for this tolerance lies in the fact that this is an exchange program. Each year in January the U. S. Committee sends its executive secretary to an international working conference, carrying in one hand his folio of student applications and armed on the other hand with his sheaf of industrial job offers. The spirit of the conference is one of friendly barter, and our secretary must try to obtain from the foreign representatives such job offers as most nearly match his students' applications. As a result, of course, he is able to place only about the same number of students as there are jobs to offer foreign students here. Last summer, due to the business recession, only about fifty-five offers were forthcoming from this country, so that less than half of the 180 U. S. student applications could be filled.

In Germany it is recognized as part of the responsibility of the university

* Inquiries may also be directed to the Executive Secretary, The United States IAESTE Committee, The Institute of International Education, 1 East 67th St., New York 21, N. Y.

TABLE I

INDUSTRIAL SPHERE OF INFLUENCE

Number of students received by the various countries cooperating under IAESTE in the summer of 1957

Industries	Receiving country																							
	Austria	Belgium	Canada	Ceylon	Denmark	Finland	France	Germany	Great Britain	Iceland	India	Israel	Italy	Netherlands	Norway	Portugal	Spain	Sweden	Switzerland	Turkey	Union of South Africa	U.S.A.	Yugoslavia	TOTALS
Aeronautics	—	—	4	—	4	—	17	—	18	—	—	—	—	12	—	—	16	4	2	2	—	—	—	79
Agriculture	9	—	3	—	—	—	14	31	16	—	—	1	—	10	1	—	1	1	27	2	—	1	1	117
Architecture	3	—	1	—	—	5	3	18	13	—	—	11	4	14	3	—	10	3	10	10	—	1	2	111
Brewing	7	1	—	—	5	5	4	14	10	—	—	—	—	—	—	—	—	5	—	—	—	—	—	51
Chemical Eng.	14	1	5	—	10	20	25	12	30	—	—	6	17	54	28	4	—	75	2	—	—	4	11	318
Chemistry	24	3	3	—	—	15	34	125	102	—	—	3	2	—	—	2	12	46	14	18	1	7	5	416
Civil Eng.	55	4	28	—	19	34	31	112	42	—	—	21	17	56	14	3	46	56	28	38	1	13	17	635
Commerce	11	—	—	—	—	1	32	26	84	—	—	—	—	—	17	—	—	21	1	—	—	—	—	193
Culture Technics	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4	—	—	—	—	—	4
Economics	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Electrical Eng.	53	9	20	—	26	36	66	137	144	1	—	7	27	95	15	12	20	96	45	22	2	21	13	867
Food Technology	—	—	—	—	—	—	—	1	—	—	—	1	—	—	—	1	—	62	—	—	—	—	—	65
Forestry	3	—	—	—	—	9	1	21	13	—	—	—	—	—	—	—	4	79	11	4	1	1	11	158
Geodesy	—	—	—	—	—	6	—	18	—	—	—	—	—	6	—	—	—	3	5	—	—	—	—	38
Geology	—	—	—	—	—	—	1	2	—	—	—	—	1	—	—	—	—	—	—	6	—	—	6	16
Graphics and Printing	4	—	—	—	—	—	—	3	—	—	—	—	—	—	—	—	—	4	—	—	—	—	—	11
Horticulture	1	—	—	—	12	—	1	8	9	—	—	—	—	—	2	—	—	2	2	—	—	—	1	38
Mathematics	—	—	—	—	—	—	—	1	2	—	—	—	—	—	—	—	—	1	—	—	—	—	—	4
Mechanical Eng.	53	17	25	—	22	59	87	371	167	—	—	7	21	89	26	1	46	197	51	37	2	26	16	1320
Metallurgy	23	2	9	—	—	5	23	51	11	—	—	—	5	3	15	—	17	106	—	2	1	1	9	283
Mining	36	2	20	—	—	20	3	174	84	—	—	—	10	5	31	2	17	84	1	16	3	5	10	523
Naval Eng'g. & Shipbld'g.	1	2	—	—	13	23	4	19	1	—	—	—	10	27	16	—	12	35	1	2	—	1	1	168
Oil Technology	—	—	—	—	—	—	8	11	—	—	—	—	4	6	—	—	—	5	—	—	—	2	—	36
Pharmacy	—	—	—	—	—	—	—	5	3	—	—	—	—	1	—	—	—	—	—	—	—	—	—	9
Physics	2	—	1	—	—	—	9	15	32	—	—	—	—	18	—	—	—	8	10	—	1	4	1	101
Science	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Textiles	2	—	1	—	—	9	1	6	1	—	—	3	3	1	—	1	—	70	1	16	—	—	8	123
Wood Tech. & Paper Mak.	2	—	—	—	3	27	—	14	2	—	—	—	2	—	1	—	4	193	—	—	—	—	—	248
TOTALS	303	41	122	—	114	274	364	1195	784	1	—	60	123	397	169	26	205	1160	211	175	12	86	112	5934

TABLE II

MULTILATERAL EXCHANGES MADE FOR SUMMER VACATION, 1957

(With figures in parentheses indicating the corresponding totals for the summer of 1956)

Country sending	TOTALS		Country receiving: Austria	Belgium	Canada	Ceylon	Denmark	Finland	France	Germany	Great Britain	Iceland	India	Israel	Italy	Netherlands	Norway	Portugal	Spain	Sweden	Switzerland	Turkey	Union of South Africa	U.S.A.	Yugoslavia
Austria	(637)	763	—	2	10	—	17	31	33	183	81	—	—	2	4	51	6	—	10	278	27	23	—	4	1
Belgium	(51)	56	3	—	—	—	—	1	8	15	9	—	—	1	2	5	—	—	3	5	3	—	—	1	—
Canada	(9)	13	—	—	—	—	—	—	3	2	3	—	—	1	—	—	—	—	—	3	1	—	—	—	—
Ceylon	(—)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Denmark	(188)	187	17	1	—	—	—	1	9	34	27	—	—	3	2	14	3	—	8	54	3	8	—	3	—
Finland	(248)	230	11	—	—	—	2	—	3	95	23	—	—	—	—	2	3	1	6	71	8	3	—	1	1
France	(367)	323	10	1	3	—	6	6	—	70	92	—	—	9	11	26	7	4	19	38	5	3	—	8	5
Germany	(1284)	1219	78	15	7	—	30	154	68	—	110	—	—	—	21	69	25	5	33	360	40	103	9	20	72
Great Britain .	(743)	731	24	8	84	—	22	17	74	91	—	—	—	3	26	62	59	7	32	164	39	2	—	12	5
Iceland	(—)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
India	(6)	2	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—
Israel	(97)	104	3	—	—	—	5	4	9	—	7	—	—	—	6	32	6	1	9	9	7	2	—	—	4
Italy	(119)	174	8	1	—	—	3	4	15	39	39	—	—	5	—	11	3	2	8	16	5	7	3	5	—
Netherlands ..	(417)	473	27	2	10	—	14	9	49	118	73	—	—	6	5	—	22	2	32	57	21	6	—	13	7
Norway	(144)	140	2	—	2	—	1	2	8	18	44	—	—	2	3	14	—	1	6	19	6	2	—	3	7
Portugal	(32)	44	—	1	—	—	—	1	8	7	9	—	—	2	4	3	1	—	1	4	3	—	—	—	—
Spain	(219)	225	9	3	—	—	5	14	19	46	33	—	—	9	12	37	4	—	—	13	10	8	—	3	—
Sweden	(415)	368	34	—	3	—	—	1	22	113	129	1	—	4	4	11	3	1	18	—	9	4	—	3	8
Switzerland ...	(162)	160	4	1	2	—	—	5	6	16	49	—	—	5	2	16	6	1	9	23	—	3	—	10	2
Turkey	(236)	365	47	4	1	—	2	11	15	210	21	—	—	5	6	18	3	1	8	6	7	—	—	—	—
Union of South Africa ..	(—)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
U.S.A.	(58)	82	5	1	—	—	2	3	4	18	12	—	—	—	5	8	3	—	3	11	7	—	—	—	—
Yugoslavia	(279)	275	21	1	—	—	5	10	11	120	23	—	—	3	9	17	15	—	—	29	10	1	—	—	—
TOTALS	(5711)	5934	303 (337)	41 (50)	122 (89)	— (—)	114 (107)	274 (304)	364 (336)	1195 (1019)	784 (774)	1 (1)	— (2)	60 (39)	123 (83)	397 (354)	169 (148)	26 (20)	205 (186)	1160 (1305)	211 (192)	175 (143)	12 (7)	86 (76)	112 (139)

faculty adviser, who submits the name of a student, to send in also an exchange job offer. And great pride is taken in both the high calibre of the student and the quality of the job that is found. This year the U. S. national committee is seeking similar cooperation from its faculty advisers; for it is not possible from a central office, and with extremely limited funds, to contact all the small and large industries that might employ one or more foreign students. These visiting students are generally excellent: one employer has commented that his had more than paid their way by the stimulus that they had brought to the departments in which they worked. All of them expect to be put to work, and they have no restricting notions about white collar jobs. All are required to speak English well, and indeed they do, having been well taught in school and been able to continue learning by going to the movies. Here are comments from two employers of a year ago:

On a student from the Netherlands: "This boy was an exceptional one in all respects. Well-trained, congenial, industrious, friendly, with high intelligence. I would be glad to have more like him."

On an Austrian, who stayed 24 weeks, being given a raise from $50 to $65: "Aptitude—excellent; Language—no difficulty; We are sold on your plan."

But of course it is possible always to pick out good reports. That these are normal may be shown statistically by the facts that of answers received to the queries sent by our office to all employers, after the summer of 1957, approximately 65 per cent were enthusiastic, 9 per cent gave approval with reservation, 3 per cent were dissatisfied, and 23 per cent made no comment. No figures are yet available for 1958.

The other side of the picture concerns our students abroad. Those who went from Yale in 1957 came back bubbling with enthusiastic approbation and thanks for the opportunity, and they eagerly set about telling their friends so that the number of applicants and enquirers for 1958 quadrupled. The major deterrent to aspirants is the low scale of European pay. It is always sufficient to provide food and lodging with a little left over; but it is never likely to cover costs of transportation. The applicant had better ask himself at the start whether, for the cost of his own transportation there and back, he can afford a summer in Europe, not viewing cathedrals and scenery, but with entrées into a small foreign working community where simultaneously he can gain good technical experience and add to his personal stature. The usual and minimum duration of any job is ten weeks. The breadth and scope of jobs exchanged in the year 1957 is to be seen from the Tables I and II. In Sweden, which invites the largest influx, students are treated as replacements for regular employees who are on vacation.

And for the future, another much larger enrollment of American students is expected for the coming year. Success in placing them will depend very much on the response of American industry. In this connection, we would appeal to all who read this to help us obtain job offers. Discussions have taken place that may bring the South American nations into the association before long.

EDUCATION FOR RESEARCH AND DEVELOPMENT

ALBERT W. DAVISON

Research Consultant
Owens-Corning Fiberglas Corporation

Presented at the Middle Atlantic Section Meeting, New York, December 7, 1957.

The education of a successful research and development technologist (I use the word "technologist" to include both scientists and engineers) starts way down in the grades. Under our present system of schooling, it takes at least thirteen years to equip a successful top-flight research worker with the complement of complicated technical and allied information he needs to practice his profession. While it might be possible to reduce the thirteen years (actually 108 months) now required to approximately ten years by a careful re-arrangement of schedules and curricula, and by sending him to school eleven months of the year instead of the conventional nine, there are certain phenomena of growth in the world which just cannot be hurried—crash programs notwithstanding! The education of a scientist or an engineer is a good bit like raising a crop of corn—it is immaterial how many tractors, or how many men, or how many loads of fertilizer and manure you put into the field, no way has yet been found to reduce the time required to make the crop much below the conventional one hundred days.

Our friends in Soviet Russia know this—they knew it way back in the early twenties—five years after the Revolution. When they set out to communize the world, they recognized there were three main programs available—war, infiltration, and technical superiority. They decided to try all three. With our assistance, they took over all of Eastern Europe through war. Later, they enslaved its people, and compelled their captured intellectuals to help them set up an educational system, and to render research services, through which the Russians hoped to gain technical superiority. And they went about the education of scientists and engineers with determination!

How blind we Americans were! We kept hearing about the progress they were making in education, how they were stamping out illiteracy and how they were devoting at least 20 per cent of their national budget to education; but we never dreamed that they were setting up what is perhaps the world's most efficient system of technical education! Only a few years ago, less than ten, we awoke to the fact that they were and are turning out more high-grade scientists and engineers than we.

Too Late?

Many thoughtful people are already beginning to wonder whether America is being alerted to this situation too late; whether we will come up with too few research and development people during the next ten critical years. To be sure there have been some voices crying in the wilderness, as it were, for nearly ten years!—The Scientific Manpower Commission and its Member Societies; your own Engineering Manpower Commission of Engineers Joint Council and its Member Societies; the Research Com-

mittee of the National Association of Manufacturers, the Western Society of Engineers, the Thomas Alva Edison Institute, and various other technical and scientific associations and bodies. Numerous Technical Manpower Conferences have been held in Washington, New York, Pittsburgh, Chicago, Atlanta, Newark and elsewhere. But their cries have, in the main, fallen upon deaf ears.

While these agencies have produced an awareness of the problem on the part of technical people generally, industrialists, secondary school educators, and school boards, warnings have made very little dent on the people generally or on politicians. It was not until 1956 that the President, acting on recommendations of research agencies within the Armed Forces and the Atomic Energy Commission, placed his influence behind attempts to solve the problem and appointed "The President's Commission for Scientists and Engineers." This popularized the program and encouraged wider dissemination of information about the crisis by means of the press, radio, television, and popular magazines.

America is not destitute with respect to young people who possess the natural qualifications for research and development in science and engineering. These are: high intelligence, ingenuity, ambition, "drive," and aptitude for mathematics, physics, and chemistry. It is believed that young people who are able to master these three basic sciences are equally able to excel in the companion sciences—geology and biology—and in the various fields of engineering, all of which represent applications of the sciences.

A Long Range Problem

Now, the long-range problem of influencing an adequate number of these mentally and temperamentally qualified young people to enter technical training, and to look forward to careers in research and development, lies way back in the adolescent years where engineering educators find it difficult to work with the youngsters. In its Second Interim Report, October 4, 1957, the President's Committee has pinpointed that there are essentially only four things wrong with the recruitment of scientists-engineers from the high school. They are: 1) lack of guidance; 2) lack of motivation; 3) lack of adequate preparation—and in a few cases, 4) lack of funds.

These shortages are adequately explained in the Report of the President's Committee and they have been laid on the line in a most masterful fashion in an address given in Detroit on November 22nd by Rear Admiral Hymen G. Rickover, which was abstracted at some length on pages 86 to 91 of the December 6th issue of *U. S. News and World Report*. If you have not already read Admiral Rickover's scholarly article, I strongly urge you to secure a copy and read it carefully. It not only outlines what we can do as individuals to attract more qualified young people into our profession, but it is full of worthy suggestions for the revamping of our system of education for scientists and engineers!

Now I have been speaking, at perhaps too great length, about the influences to which a youth is exposed during his secondary school years, before he ever steps inside the technical school. When he does get in your hands, what are you, who will specify and direct his final and more mature formal education, going to do to and with him? What subjects will you teach, what subjects will you omit, and how will you guide the general "outside reading" of your students to fit them well to take their places as research and development

workers in the complex social and technical world in which they will live and labor?

I was much impressed a few years ago when an engineer, whom I have always regarded as one of the real leaders in his profession, told me that in his professional career he had used very little of the material he learned in college with the exception of fundamental science. It was all obsolete five years after he graduated. The things he had used were unheard of during his student years. But he had used the fundamentals, over and over again. Those of us who are past middle age all know this to be so.

Increasing Scope

In the days of the growing complexity of scientific and engineering knowledge, when man is discovering new phenomena in all areas of knowledge with unprecedented speed, the scope of technical information which a top-flight research worker must possess is increasing at an astonishing rate. At the turn of the century, technical knowledge corresponding to a Bachelor's degree in science and engineering was adequate preparation; at the end of the First World War, a Doctor's degree or equivalent was necessary; but today, post-doctorate training is needed to qualify for the highest grade of research work.

Within the scope of the subject assigned this panel, we must not overlook the fact that we are in reality discussing two independent subjects: training for the research worker, and training for the development engineer. Although these types have much in common, we must not fail to differentiate between their functions—as well as between their scholastic needs. It is becoming increasingly apparent that research is being taken over more and more by the scientist, and development work more and more by the engineer. This is probably as it should be, and marks a division of labor quite in line with the aptitudes of the technologists involved.

Now there are certain fundamental considerations which I believe are common to both types. Let us consider them for a few minutes. The bases of all scientific and engineering effort are mathematics, physics, and chemistry. A thorough grounding in these three fundamental sciences should be the goal of every embryonic research and development man, it being understood that there can be no deviation in the amount of mathematics he must master. After the first three fundamental courses in physics and in chemistry, the additional amount of study of these subjects to which he might apply himself would be conditioned by the area of research (or development) which he elects to enter. That is, if he knows!

Narrow Training

One of the principal criticisms aimed at members of the scientific and engineering profession has been that their training and education has been along too narrow lines. And incidentally, that is one of the major faults of the current Soviet system. Research and development people, above everyone else, must be free from this criticism. It is at once apparent that a full realization of the impact of their discoveries and applications upon our civilization, and upon the political status of our nation, must be possessed by those who expect to be leaders in the technological developments of their generation. That calls for a knowledge of the humanities and of history, particularly economic and political history. In the same manner, a sound knowledge of economics is essential to the success of a research man.

There is one other area of intellectual activity which has been sadly neglected throughout our whole school system, in the grades, the high schools, and in the colleges and technical schools. That is the use of the English language in all of its various aspects, including spelling, grammar, vocabulary, composition, speech. While English is important to any engineer or any scientist, it seems to me it is most important to the research or development man, who depends upon the spoken and written word to convey his ideas, often esoteric, complicated, involved and concealed, to his fellow workers and to his management.

To the man who has elected the engineering rather than the scientific route, there are still other intellectual skills which need to be acquired. These include thermodynamics, fluid dynamics, advanced mechanics, strength of materials, and machine design. I have come more and more to the belief that for research and development work, a sound training in "general engineering" furnishes a better preparation than do compartmentalized curricula leading to degrees in one particular branch of engineering.

Perhaps the most important part of the training of a research and development technologist is an early decision of a man to do research or development work; he should begin his training during undergraduate and graduate school days, and should exhibit his competence to perform a finished, intellectual job. In recent years, with the rise of avaricious practices on the part of some institutions in acquiring government-sponsored research for pecuniary reasons, there may have been a tendency to accept lowered standards for doctoral dissertations. This practice will cure itself as students and employers discover what is going on.

It is quite probable that the majority of you will disagree with many things I have said about education for research and development. I have only tried to present one man's opinion, based upon observations extending over 25 years spent in the teaching of science and engineering, and more than fifteen additional years devoted to industrial research and development.

PROGRAM IN ENGINEERING MECHANICS UNIVERSITY OF ILLINOIS

College Notes

The Department of Theoretical and Applied Mechanics of the College of Engineering, University of Illinois, now offers a four-year undergraduate program leading to the degree of Bachelor of Science in Engineering Mechanics. The curriculum is designed primarily for those interested in research and development careers in the field of engineering. Special emphasis is placed on mathematics and fundamental principles.

COMMUNICATIONS AND ELECTRONICS RESEARCH IN THE UNIVERSITY

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Acknowledgment: The author has profited from many discussions with friends from other university and industrial research laboratories and with his colleagues in several universities. The ideas set forth here are essentially an organized composite of their opinions. It is conjectured, however, that although many of these friends and colleagues would agree with most of the points expressed, properly enough none would agree with all of them.

The function of a university is to collect disordered facts, place them in order, and dispense them as organized knowledge. It is interesting that all three processes are essential both to an active educational program and to an active research program. It is too often assumed that education consists solely of the last of the three processes and that research consists solely of the first.

Small acquaintance with the problem will lead, however, to the obvious facts that good education cannot be simply the dispensing of knowledge from prepared organization in a text book, and productive research cannot be merely the collecting of facts. The educator must continually bring together new facts and place them in order. The research scientist must place his facts in order and dispense them in order if he is to generate new bases for further research.

In the area of communications and electronics engineering it is particularly true that an adequate educational facility must have close contact with new development. This contact can be provided by maintaining sponsored research programs in close contact with the instructional staff of the university. Many questions have arisen in recent years relative to "sponsorship and academic freedom," "basic" versus "applied" research, "cooperative" versus "individual" research, and so on.

It is the author's opinion that research is inseparable from the educational process at the university level, and that many benefits are to be derived both in and out of the university environment under properly controlled conditions. Recent publications in the *Proceedings of the IRE* have presented discussion of industrial research organizations, personnel, and problems.[1] Some of the factors particularly involved in university research in communications and electronics are discussed in the following paragraphs.

Kinds of Research

The commonly used terms "basic" and "applied" research are frequently difficult to differentiate, for "basic" research soon finds applications and applications soon generate the need

[1] E. W. Engstrom, "A Profile of the Man in Industrial Research," *Proceedings of the IRE*, Dec. 1952, pp. 1637–1644.

D. B. Harris, "The Organization of Research," *Proceedings of the IRE*, Aug. 1951, pp. 868–873. This article deals with organizational problems in general with no particular emphasis on problems peculiar to either industry or universities.

for basic research. The following definitions are offered in substitution.

Scientific Research: Research directed toward the better understanding of natural processes and resulting in new laws or scientific knowledge.

Engineering Research: Research directed toward the development of new design or processing techniques and resulting in design formulae and procedures.

This differentiation has been well stated by E. R. Piore,[2] "Basic research in electronic engineering is a fundamental and philosophical approach to a problem with the goal of controlling nature in a reproducible manner, as contrasted to basic research in science where the interest is in a more profound understanding of the external world." Notice that "basic" research is applied to both ideas. When the means of understanding or control are not known, basic research is necessary.

It is inevitable that the man involved in engineering research with specific applications in mind will find a certain amount of scientific research necessary. Recent investigations in solid state physics generated by applications of semiconductors, ferroelectric materials, and ceramic magnetic materials in electronic circuits are examples. The number of "basic" papers on germanium, silicon, barium titanates, and ferrospinels in the last few years gives evidence of the interest.

Again, new developments in vacuum tubes and gas tubes have stimulated investigation into behavior of electrons and ions under various boundary conditions, the thermionic characteristics of emitters, and origins of noise in physical processes. Computer technology and need for increased channel capacity in communication systems have stimulated development of the mathematical theory of communication.

[2] E. R. Piore, "Defense Department Plans for Basic Research, The Navy" *Electronics*, Aug. 1951, p. 86.

Cooperative Research

The term *cooperative research* implies that a team of research workers are operating with a common objective. This has been the spirit of most scientific research for well over a century, though the research organization, as such, is of relatively recent vintage. (To demonstrate, try to name a research organization employing twenty-five scientists prior to 1900.) In 1950 a survey indicated 1,270 industrial laboratories employing more than 15 personnel for research in the physical, chemical, and pharmaceutical fields; 459 of these groups employed more than 50 persons.[3]

Cooperative research effort in communications and electronics has several advantages to universities, as well as obvious advantages to industry and government. A few of these are the following:

1. The use factor on expensive instrumentation can be made higher (i.e., signal generators, standards, spectrum analyzers, microwave equipment).
2. Specialized facilities can be afforded; for example, an Electron Tube Laboratory, a Solid State Devices Laboratory, and computer installations.
3. Seminars and other discussion groups can be organized on advanced topics. These invariably stimulate new ideas.
4. Services of electronic technicians, draftsmen, secretarial staff, and mechanics can be more efficiently used.

[3] R. N. Anthony, assisted by J. S. Day, *Management Controls in Industrial Research Organizations*, Harvard University Printing Office, Cambridge, Mass., 1952, p. 444.

5. Specialized industrial interest can be attracted in the areas of cooperative effort.

It is true that it is possible for the research organization to suppress the individual's "academic freedom." On the other hand, if the small research organization adopts the principle that the employment of two individuals who think alike is unnecessary, individuality will *not* be destroyed. *Engineering research* in communications and electronics frequently involves system designs which necessarily, in the interest of efficiency, involve several individuals. These individuals will have different specialties and concerns in *scientific research*. In any case, the supervisor of a cooperating group of individuals must have broad scientific and engineering comprehension and is challenged to do a good job in coordination of effort and use of facilities.

Sponsored Research

With these definitions in mind, let us consider the effect of sponsorship on the university research program and the value of university research to the sponsor. Sponsorship is essential for a well rounded program in the area of communication and electronics because instrumentation, components, and facilities are all expensive.

The major objectionable feature of sponsorship, on philosophical grounds, is the alleged "control" exercised over the research engineer. The facts are that the research engineer is always subject to "control" imposed by his training, environment, and facilities. If he is of proven ability he can minimize this control in negotiation for a sponsor, since it is usually possible to find a sponsor who needs progress in the investigator's own field of interest.

The basic thesis that research and education are inseparable in the university environment limits the magnitude of the research effort and, therefore, the amount of sponsorship possible. The number of instructional staff in the communications and electronics curriculum of an engineering college is limited by the number of students and the laboratory facilities. Separation of the educational and the research function will begin when the program becomes large enough to include areas of research not involving substantial participation by instructional staff or students.

Under these circumstances, the university becomes an administrative agency for a research laboratory which might easily be supported and recognized in a completely separate environment. The *cooperative research* idea gives way to a complex of cooperative research teams working in separate areas and sharing *facilities* rather than *problems*. In some cases which have developed to this extent, economic advantage and prestige are derived by the university, but the value to the educational program is questionable.

In expanding a university research program, the point of diminishing returns is difficult to determine because of variability in the work loads, capabilities, and interests of the instructional staff. Active participation in one or two projects and frequent technical contribution by consultation with from three to six individuals working in related fields is an average limit. The number of participants is then increased by employment of full-time research personnel who maintain continuity in day-to-day programming of the research effort and close contact with instructional staff and students.

It is also desirable to maintain *diversified* activity in the university research effort because the educational program is necessarily balanced to suit student needs. Undue special-

ization will make the research program top-heavy in certain areas and thus will tend to separate the educational and research function in those areas. Thus, in communications and electronics research, interest in components (i.e., tubes and materials), networks, electromagnetic engineering and theory, all frequency ranges (audio to microwaves) circuit and system design, and communication theory should be supported with equal emphasis.

It is only natural that certain universities will go through periods of recognized leadership in certain fields, but in the long run a balance should be maintained. In industrial research the converse may be true. It is, for example, appropriate that a large industrial laboratory devote the efforts of 50 engineers and scientists to study of phosphors or magnetic materials for their particular company interests. In a university, on the other hand, participation of as many as ten men in such an applied program begins to appear excessive. (It is important also for the university staff member to realize that too little participation in research, as well as too much, tends to separate the educational and research function.)

Sponsor Value

What then is the value to the sponsor of participation in the support of university research in the *applied* sciences of communications and electronics? The answer can be summed up by considering the probability of occurrence for a new idea related to a particular application. This probability is increased by:

1. The research engineer's knowledge of the application.
2. The broader and more fundamental base of the participating university staff member, brought about by his frequent association with students and faculty in the related sciences.
3. The relatively stable and continuing interest of the university staff member in a particular research area.
4. The increased capability of graduate students provided with an "internship" in a university research program while working toward advanced degrees.
5. The increased capability of all students resulting from closer contact with engineering applications on the part of the faculty.

The first, second, and third items on this list are of particular importance to military sponsors in peacetime. By acquainting the university staff member with military problems and providing support to research in areas of critical importance, a potential is developed which can be tapped in times of need to provide technical guidance for large and varied programs.

In the communications and electronics field, for instance, development of new components, circuits, and theory is based upon *scientific research*, which is generally of greater interest to the university staff member than is strictly *engineering research*. On the other hand, knowledge of applications is conducive to good *engineering research*, which is the basis for development of electronics systems of use to the military. Thus, military sponsorship of university research in peacetime will both add to the "stockpile" of available components and develop the potential in a relatively large and stable group of research men as an aid to rapid electronic system development in an emergency.

The point of view of industry must be somewhat different in that the returns are expected to be more imme-

diate and the values of items 4 and 5 are probably equal in importance to those of the first three headings. The worth to industrial sponsors is also complicated in the highly competitive areas of communications and electronics by concern over patents and industrial secrecy, which cannot easily be controlled in the university environment. In general, then, it would seem that industries needing research in areas beyond the scope or outside the specialty of their own research organizations are most likely to favor sponsorship in the university.

Conclusions

The cooperative research organization must be recognized as being in its very early stages of evolution. Surprisingly enough, in this development the industrial organization is further along than the universities, in that a similarity of pattern appears when several commercial organizations are studied, whereas major university research structures display many basic differences. The university has long offered an environment wherein individualism can thrive, and there is definite merit in the preservation of this environment.

On the other hand, there are indicated in the above discussion merits to be derived from the environment of cooperative sponsored research in the improvement of education, provision of better facilities, and return of value to the sponsor. It will be interesting to discover, in the continuing development of the pattern of research in universities, whether the merits of these environments can co-exist.

ENGINEERING PROGRAM AT AAAS MEETING

National and international aspects of systems of units in coordinated disciplines of science and technology will be the theme for the Section M—Engineering program of the 125th Annual Meeting of the American Association for the Advancement of Science, in Washington, D. C., December 26–31, 1958.

The Section M program will be held in the Washington Statler Hotel on Monday and Tuesday, December 29 and 30. Subjects to be covered include (a) English vs. Metric Units and (b) Absolute vs. Gravitational (Technical Systems); (c) review of the MKSA System (meter, kilogrammass, second and ampere) and the Absolute System which recently has been adopted by several foreign countries.

Programs will be available after October 1 from: Secretary, Section M (Engineering), AAAS, c/o Engineers Joint Council, 29 West 39th Street, New York 18, New York.

PROFESSIONAL AND MANAGERIAL GOALS IN ENGINEERING EDUCATION: A SOCIOLOGIST'S COMMENT

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The molding of a professional man is a significant act of social creation, for which the professional school takes major responsibility. Nevertheless, as R. K. Merton writes, "There is very little systematic knowledge about the social and psychological environments provided by schools in the various professions, and about the ways in which the processes and results of learning are related to these environments" (1).

Merton has started to formulate such systematic knowledge in the case of medical schools; no comparable inquiry has been undertaken in the field of engineering education. Yet the work and creative nerve of the engineer are fully as important to our society as those of the doctor. Furthermore, after four years teaching in a technological institute, the writer can testify, that the field of engineering education offers many challenging problems to a student of behavioral science.

The Problems

One such problem, which may seem only indirectly related to education, is to explain the critical attitude that many engineers and managers currently take toward one another. While the relation of engineers and managers has been traditionally cordial in American society, evidences of mutual disenchantment appear today with some freqency. As an example from the management side, J. Odiorne, a personnel officer in industry, asks "what is the trouble with engineers? Why have they so little understanding of management's job and problems? Why is it often so difficult to train them to assume management responsibilities (2)?"

Engineers on their side do not regard management with unmixed feelings of approval. A survey of nearly 400 engineers in the Chicago area discloses that they tend to be "chronically frustrated and dissatisfied" with their industrial employment. Significantly, engineers express strongest dissatisfaction with the "effectiveness of administration" in the companies for which they work (3). Similar results appear in a survey of the morale of engineers in industry conducted by the National Society of Professional Engineers (4).

One explanation for this situation is suggested by the sociologist H. A. Shepard (5). Calling engineers "marginal men," Shepard claims that their work requires them to mediate between the frequently conflicting demands of two different cultural worlds: those of science and of business. Although heavily dependent on both cultures for his livelihood, the engineer is not fully identified with either one. This frequently places him in a "damned if he does—damned if he doesn't" position. According to Shepard:

> If the engineer shows more than a "fix-it" interest in an industrial problem, the businessman is likely to refer to him as a long-hair or prima donna. If he

shows no interest in science and prefers to "cut and try," the scientist regards him as a technician, mechanic, or maintenance man (pp. 537–8).

Small wonder that many engineers express dissatisfaction with their work situation! Underlying this marginality between the cultures of science and business, however, is one even more fundamental: that between occupational role-identification as professional on one hand, or as managerial, on the other. To the extent that he identifies himself with business management, Shepard implies, the engineer's work attitude will be dominated by empiricism and considerations of market practicality. To the extent that his role-identification is professional, his work approach will be closer to the pole of disinterested scientific curiosity.

That role-identification as "managerial" or "professional" poses a real dilemma for practicing engineers is shown by the recent NSPE survey: "Career Satisfactions of Professional Engineers in Industry" (1957). "In defining the ideal job," this survey reports, "engineers do not put great stress on being treated as part of management—yet, those who feel they are not so treated resent it. . . . The point of view in leading companies usually is that engineers are professionals and as such are part of management. . . . But there is need for engineers themselves to agree that they should be identified with the management group" (p. 26; see also pp. 14–17).

To what extent must engineering education take responsibility for placing its graduates in this marginal position between professional and managerial status, and what can engineering educators do about it? In approaching this question, it may be useful to review briefly some traditional assumptions of engineers regarding their relationship to managers, to see how these assumptions have shaped the curriculum of technological education.

Assumptions Reviewed

Systematic higher education for engineers developed at a time when it was thought that the distinction between managers and engineers could safely be ignored. Organizational means did not seem to overshadow technological ends; and the heroic image of the engineer as inventor, builder, and works director rolled into one supplied the model to which curricula of engineering institutes were tailored at the turn of the century.

Education for the engineer consisted therefore almost wholly of study in the physical sciences and their mechanical applications to industrial production. That social relations involved themselves in this production was never denied; but in the hands of men like Taylor and Halsey, the management of social relations could apparently be reduced to relatively simple extensions of techniques for controlling energy that were already familiar to mechanical engineers—in a word, to scientific management.

In the twenties, the art of personnel management took precedence over scientific management as the key to successful organization; in the thirties the social-psychological studies of Elton Mayo brought human relations to the fore in management thinking. The concepts of the personnel and human relations approaches to organization differed sufficiently from those of ordinary engineering practice to establish management as a specialty distinct from engineering with respect to the skills and not only responsibilities involved. Even so, if the engineer and the manager were no longer

assumed to be practicing the same skills, they could still be regarded as the same persons—at different stages of their careers. Engineering viewed as the road to management success became the second guiding assumption of engineering education.

Curriculum revision in line with this assupmtion brought to the technological institutes specialists in such unfamiliar fields as cultural anthropology, group dynamics, and industrial sociology; it also added vastly to the humanities departments of language, history, and art. "Humanize the engineer" became the new watchword: "teach him to work more effectively with people."

Exposed to the history and culture of western civilization, practiced in the techniques of group dynamics and human relations, a man armed with sound knowledge of engineering could not fail to go far. Success, with reasonable effort, would be his—and interviews with engineering students at representative colleges reveal a generalized, cup-runneth-over optimism concerning their prospects seldom found among students in other fields (6).

It is against the background of these expectations that we must place the criticisms engineers and managers currently make of one another. By humanizing engineers, the institutes of technology have apparently not taught their graduates to work effectively in management, in the opinion of many managers; nor have they given their graduates a passport to appropriate occupational status, in the opinion of many engineers.

Engineers themselves, through their official representatives in the National Society of Professional Engineers and other organizations, have responded to this situation by calling upon engineering colleges to stress professionalism—as in the requirements for certification, for graduate study, for heavier emphasis on basic sciences in the technological curriculum. They have done so hoping that if engineers themselves become more aware of their status as professionals they will win more respect from management. Furthermore, these representatives have appealed to industrial management to employ graduate engineers in a professional capacity, and to set up in their organizations more effective channels of communication with the engineering staffs.

From this brief review, it appears that technological education today, as in the past, is being shaped by the natural desire of engineers to win a respected and responsible place for themselves in the industrial organizations that constitute the principal markets for their talents. Today two main forces, and two concepts of what that place is, are struggling for dominance in shaping the engineering curriculum. On the one hand is the drive to humanize the engineer as a way of smoothing his path to the executive suite. On the other hand is the drive to professionalize the engineer as a means of winning the *respect* of management, if not necessarily a place in it.

It is time that engineering schools ask themselves: can a system of education designed to produce successful managers at the same time produce satisfied professionals? Conversely, can a system of education designed to produce successful professionals produce equally successful and satisfied managers? Perhaps it is the confusion of goals in engineering education itself, with the resultant conflict which this sets up in the mind of the practicing engineer as to what constitutes success for him, that accounts at least partially for the dissatisfaction that many engineers seem to express in their work situation.

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(1) Merton, R. K., *et al.*, "The Student Physician" (Cambridge, 1957), p. 37.

(2) "The Trouble with Engineers," *Harpers*, Jan. 1955. See also Drucker, P. "Management and the Professional Employee," *Harvard Business Review*, May–June 1952; Sprague, R. C., "Training Engineers for More Effective Results in Industry," *J. Engrg. Educ.* (43–1953).

(3) Moore, D. G., and Renck, R., "Professional Employee in Industry: The Unhappy Engineers," *J. of Business*, Univ. of Chicago, Jan., 1955.

(4) "A Professional Look at the Engineers in Industry," National Society of Professional Engineers, 1956.

(5) "Engineers as Marginal Men," *J. Engrg. Educ.* (March, 1957).

(6) Becker, H., and Carper, J., "Identification with an Occupation," *American Sociological Review* (June 1956), pp. 345–6.

OPERATIONS RESEARCH SHORT COURSE AT CASE

Operations Research, a scientific method for making effective management decisions, will be the subject at a ten-day, introductory short course at Case Institute of Technology from January 19–30.

Designed for men with research experience and an understanding of mathematical symbolism, the course will outline areas in which OR methods, tools and techniques have become important in American business and industry. Case is a pioneer in OR and OR short courses, having the oldest academically based Operations Research Group in the country, and is offering the short course for the 14th time since 1952.

The course was designed by Dr. Russell L. Ackoff, Professor of Operations Research and Director of the Case OR group, and Dr. E. Leonard Arnoff, Associate Professor of OR and Assistant Director of the group. There are more than 700 graduates of Case OR Short Courses. The short course will cover the history of operations research; formulating the problem; mathematical models of OR; communications; scheduling; theory of games; and replacement and maintenance. Other areas of the OR program, including the use of computers and the administration of operations research, also will be offered.

Fee for the course is $375, which includes all instructional fees, 10 luncheons, six dinners, textbook and classroom supplies. Living quarters are available at the expense of the registrant. Inquiries and applications should be addressed to Dr. E. Leonard Arnoff, Assistant Director, Operations Research Group, Case Institute of Technology, Cleveland 6, Ohio.

OUR GREATEST NEED IN SCIENCE AND ENGINEERING EDUCATION

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Formulating our needs for scientists and engineers is a very complex problem; there have been many "imaginary" expressions for it; it is believed that the expression presented in this paper is a "real" one.

We hear, time and again, the cry for scientists and engineers, but at other times we hear that the supply is plentiful, that it is perhaps greater than the demand. One would thus wonder what our real needs are.

Of course there is a need for scientists and engineers, not a need for quantity, but rather quality. Indeed, the need is now pressing for scientists to lead.

For this leadership, however, we do not need puppets who are parasites on science, satellites for any center of money or of power and who, in the pursuit of any material gain, are willing to sell their intellect and their principles, with nothing left for them to live for or to fight for.

We have no need for men who are apathetic and indifferent to the affairs of the community, the nation, and the world, for those who, when they reach the top, stay in their ivory towers and do not care to lend a helping hand to somebody who is in need of such help, but may in their selfishness make his course more difficult, taking advantage of his deficiencies rather than helping him overcome them.

We have no need for men with a long list of degrees and publications behind their names, but who end up committing suicide or engaging in a scandal. Such men would set a very bad example for our students and for our nation.

We need scientists who are wise and mature and who have a real concern about community, national, and world affairs, who, when the wheel of leadership is given to them, drive carefully, courteously, and wisely obey the laws that govern the security of all of us.

We need scientists whose values are founded on the worth of men, not on material considerations; thus, as time goes by, they increase in wisdom and in maturity, and thus their worth always goes up regardless of whether we are in a recession, a depression, or in great economic prosperity.

We need scientists who recognize that the tools we develop are to serve us, not become our masters.

We need scientists who have a faith to live by, who believe that security comes from within and that big trees do not fall under the pressure of the wind unless their heart is already decayed. We need scientists who believe that freedom is within us and

who neither dominate nor submit to domination.

We need scientists who believe that truth might come through them, but that they do not own it and that they must transmit it fully, freely and reverently without expecting recognition or any commission of any form, bringing about the fulfillment of the words of Tennyson:

Let knowledge grow from more to more,
But more of reverence in us dwell.

We need scientists bubbling with happiness and enthusiasm, and who in being so dynamic, excite others from their dormant state to radiate their very best, and in turn excite more, resulting in a chain reaction of positive contributions.

We need scientists who recognize that they have been forunate to be given more intellectual power, and that therefore with these gifts go higher responsibilities; that because their eyes can penetrate the thick fog of life, scientists have a responsibility in leadership to clean the road from negative elements that retard or prevent our maturity, and to issue a definite warning if they see any danger that nobody else can see, and who recognize that if they do not speak then, their silence would be a grave mistake against the people whom they lead. "For unto whomsoever much is given, of him shall be much required: and to whom men have committed much, of him they will ask the more."

We know that many a mature plan is abused in immature application. As a simple example, let us consider food. It is good to plan a meal; food gives our bodies nourishment and strength. But if food is abused, and one indulges in overeating, the result is unhealthy fattening and many associated illnesses. Consider also the ingenious plans that gave us matrices, operational mathematics, computers, etc. Many times these effective and useful tools are abused in an infantile, immature application when used as a show to sell a cheap research. I am certain you can think of many other examples. We need scientists to expose and fight such abuse of our precious resources.

We need scientists whose mission is to make complicated things simple, available to the many, rather than making simple things complex so only the very few can demodulate a useful message from them. We need scientists whose concern is to fight the superficial attitude of placing more emphasis on the "gift wrapping" rather than on the contents.

Of course, it will be foolish to expect scientists, while human, to be without shortcomings. But we need scientists who, when they make mistakes, are willing to admit them and correct them. Thus their faults are those of the younger prodigal son who recognized his mistake and came back and not the fault of the older prodigal son who never returned.

Our need is greatest for scientists and educators who hold sacred the principle of "academic freedom," that it is not only a man's right, but it is indeed his duty and responsibility to speak his mind fully and freely. We need scientists who recognize that the quota of words a man is permitted to speak is infinite and that this quota is not proportional to his rank or to the number of papers he publishes, that lower and higher ranks exist only on paper, but that actually there is one continuous, never ending process of growth and maturity. We need scientists who take seriously the words of Jefferson: "I have sworn upon the altar of God eternal hostility against every form of tryanny over the mind of man."

We need scientists who recognize that a man's contribution to an institu-

tion of learning may not be in the form of books or papers, but may simply lie in fighting for righteous, free and mature frames of reference, because how could we have truth in a frame of falsehood, or how could we have maturity in a frame that is immature?

A little boy woke up at night listening to a clock whose mechanism was out of order, and counting: 1, 2, . . . 11, 12, 13, 14, . . . Frightened, he ran to his daddy saying, "Daddy get up, it is later than it has ever been before." It is time that we get up and, in our recruiting for young engineering and science educators, look for these elements of greatness and give them every encouragement to develop. Men who have these qualities are very few and rare indeed; these are the only ones who deserve the name "scientist," who can meet a motto equivalent to "VERITAS" of Harvard, which is interpreted by ex-President James B. Conant to mean "integrity of character and excellence in performance," but never the one without the other.

The need is greater now than ever before for scientists who have courage enough to stand and fight for principles we hold dear and who will die before they give up any of these principles. We need scientists who fight issues, not men, so that all their energies will not be dissipated in internal frictions with very little over-all output. They remain always objective; in the words of Lincoln, their fight is "with malice towards none, with charity for all."

Our greatest need is for an infinitely lofty Reference to measure our performance; so as we feed back the error relative to this Reference, we keep going upwards in an endless process of correction. Our greatest need is for an "H" security clearance, a clearance of the heart so that it can reflect with fidelity the everlasting and eternal truth. Our greatest need is for a philosophy of education based on a philosophy of life inspired by the original ideals on which this country was founded. Our greatest need is for a faith to live by for a solid foundation of rock to build on. Our greatest need is to be able to say truthfully, "IN GOD WE TRUST."

RESEARCH COORDINATOR APPOINTED FOR CATHOLIC UNIVERSITY

College Notes

A special office to expand and coordinate university research activities has been established at The Catholic University of America, according to an announcement made September 6 by the rector, Rt. Rev. Msgr. William J. McDonald.

At the same time, Msgr. McDonald announced the appointment of Francis G. deBettencourt, aeronautical engineer and 1948 CU graduate, as first Coordinator of Research.

The newly created office will centralize administrative aspects of the University's growing number of basic and applied research contracts, obtain sponsorship for new or continuing research, and develop a full level of research activity compatible with the needs and enlarging capability of the University.

ENGINEERING PROBLEMS AHEAD AND THEIR MEANING FOR COLLEGE EDUCATORS

W. SCOTT HILL

Manager—Engineering Recruiting
Engineering Personnel Services
General Electrical Company, Schenectady 5, New York

The lapse of 2 years between this statement and the present is an interesting commentary on the rapidity of technological change.

These remarks, originally made before the ASEE at Seattle in 1956, represent an effort to have industry indicate the direction which engineering work appears to be taking. I was asked to select some of the problems which college students of the next few years will be called on to grapple with in the next decade. Here are some admittedly difficult ones, drawn from the electrical manufacturing field, which have been simplified until they are mere suggestions. It is hoped that they are sufficiently challenging so that engineering graduates will be motivated to prepare themselves with an academic foundation from which they will grow in engineering stature until they can solve similar ones.

Heat Transfer

In the boiling water reactor for nuclear power, we need to know how to improve heat-transfer characteristics between uranium-type fuels and water, how the surface films act, and how to improve stability. The rapidity of commercial development depends in part on these factors, and on increased technical knowledge for accurate prediction. Again how will we remove heat from turbine blades as still greater energy is taken from each component blade in the larger turbines projected for the future?

In the stratosphere, we meet a totaly different temperature problem than at normal elevations. How will heat of control-power elements and fuel combustion be disssipated? What form of heat sink is most effective? And what materials will tolerate these temperatures?

Thermodynamics

The heat pump needs supplementary heating for colder climates. We need to develop a heat-storage system to utilize solar energy and so broaden the application of the heat pump to a more universal solution to the domestic heating problem.

Fluid Flow

Air supply for a gas turbine may seem a relatively well-established determination. But, are we designing for best efficiency? How would you deal with the question of air supply to the compressor unit of a gas turbine powering a locomotive in a long tunnel?

Using the principle of angular momentum imparted to a liquid fuel system and then measuring the energy removed down-stream, the mass flow meter was developed. Can this be developed for other fluids, and can it be built to the accuracies demanded of modern instrumentation?

Electronics

If a rocket is to operate at great elevations or in outer space, can we send information to and from it above the ionosphere? What new techniques, if not principles, will have to be developed?

The radar tracking of sky objects is an everyday occurrence, with equipment to lock on and hold. However, what discrimination do these systems have, for example, between a missile and a meteor? Should we be able to distinguish, and if so how?

Transistors do not seem to behave correctly when used in an atomsphere of nuclear radiation. What causes this and how do we prevent it? Transistors have been used in building more sensitive negative-phase sequence relays for power system work. There may be a complete redesign of the whole protection system just over the horizon, using new electronic devices. Are engineers in the power field equipped to take advantage of these developments?

Computers

Digital computers are used for electronic data processing to determine jet engine performance, to simulate airplane flight control, to try out controls for submarine nuclear power plants, to calculate heat rates for turbines or to design turbine buckets, and as aids in designing transformers and motors. Will tomorrow's engineers be able to reduce empiricism in material and weight and cost still further by pinpointing marginal variations and become precision designers by better understanding of computer methods?

Can information on an incoming missile be utilized by computers to calculate backwards and determine its source, all within its flight time?

Computers are now used for continuous control of a "system." Suppose, however, the system reactions are very fast; how do we design the feedback controls not only for stability, but to operate the overall system at optimum conditions for speed?

Dynamics

Reverting again to the problems of a missile, systems such as some of those already operating require analysis of all the torques, internal motions, and forces involved. If you are given this assignment, how would you correctly direct the motion of a platform in space which itself is undergoing random motion?

Materials

Oriented grain steels are common in magnetic structures of generators and transformers. How can these be adapted for mass production and ultimately automation? How rapidly can we improve the behavior of shielding and structural materials under nuclear radiation?

Turning to the power field, 3,600 rpm turbine-generators of 75,000 KVA were built ten years ago. Now we are making 192,000 KVA units with conventional designs. By the use of conductor cooling we are able to build 384,000 KVA units. Projections indicate that in 1965 our young graduates will be building single generators of over 500,000 KVA. To do this will mean great efforts expended on such elements as rotor forgings, improvements in insulation, and gains in cooling techniques. Perhaps a plastic barrier in the air gap will permit the stator to be liquid-cooled, by flooding, while the rotor could be hydrogen-cooled or even liquid-cooled, with a heat exchanger to the coolant gases.

Conclusions

These problems have touched on the broad fields of energy conversion, energy utilization, communication and control, and materials. Are these enough to suggest the kind of education for tomorrow's problems? Science courses are certainly a must. Wherever we turn, materials appear as one of the barrier problems, hence some background in chemistry and metallurgy is certainly in order. Many examples requiring the engineering sciences of mechanics of solids or fluids, thermodynamics, and electrical sciences have been cited.

Mathematics is a means for expressing complicated and logical relationships; in the engineering field it is first a tool for performing technical work, and secondly a preparation for reading the literature of these fields. We see the increasing importance of computers; in fact they may well be the right hand of the engineer of tomorrow. Electrical problems, whether in the power or electronic field, involve an understanding of electromagnetic theory. "Systems" thinking, feedback control, and electronic circuitry have appeared frequently in the examples.

At the bachelor's level our educational thinking should be in terms of fundamentals rather than specifics. We would like graduates with ability to synthesize the various component studies of their technical education. For some time to come, industry may expect to develop them in problem-solving to undertake the barrier problems indicated.

The task faced by educators is one of the most difficult in this whole process. How to regroup your academic courses to accomplish this is a problem which falls in the province of the educator. You may recall the story of the police officer who had a phone call reporting a theft from the caller's car. In a thick accent, the caller detailed the missing parts—steering wheel, brake pedals, instrument panel, all had been stolen. Then in a few minutes he called the police again; "Forget it, I got in the back seat by mistake."

Your students today are the graduates of tomorrow. You don't want them calling back to report that their education had important parts missing and that they were in the back instead of the driver's seat.

NATIONAL SCIENCE FOUNDATION PROGRAM DIRECTOR FOR ENGINEERING SCIENCES

The National Science Foundation has announced the appointment of Arthur H. Waynick as Program Director for Engineering Sciences, Division of Mathematical, Physical, and Engineering Sciences. Dr. Waynick is on leave from Pennsylvania State University, where since 1948 he has been Professor and Head of the Electrical Engineering Department and Director of the Ionosphere Research Laboratory.

. . . . . YET-TUDES

VIEWS AND NEWS CONTRIBUTED BY

The Young Engineering Teachers

JERRY G. RICHTER, Chairman
Pennsylvania State University

THOMAS H. ROCKWELL, Editor
Ohio State University

TO THE YOUNG MEMBERS OF ASEE

JERRY G. RICHTER

Assistant Professor of Mechanical Engineering
The Pennsylvania State University
University Park, Pennsylvania

The traditional function of one of the early YET-itudes of each new academic session is to give the incoming chairman of the Committee for Young Engineering Teachers (CYET) an opportunity to briefly outline the program of YET activities for the coming year. It is to this end that these lines are directed to the young members of the ASEE. However, before outlining the future program it would seem appropriate to first briefly review some of the history, organization and progress of the YET movement to date.

The YET Movement

In 1951 the ASEE formed the CYET for the express purpose of giving young members of the Society a greater opportunity to participate in its activities. Since that time, Section Committees and Institutional Groups have been organized throughout the country to carry on YET activities at their respective levels. During the 1957–58 period over 130 of the nation's engineering colleges and institutes of technology had YET Representatives (one for each school). The steady increase in the number of YETs participating in the activities of these groups and committees has demonstrated the need for a YET organization within the Society. At present the CYET (a national committee) is made up of twenty-three members: seven national officers and sixteen Section Representatives. Each Section Representative acts as a link between the national committee and the Institutional YET Representative and in many cases also acts as chairman of a Section YET Committee. The Institutional Representative has the important responsibility of directing a local group at his institution and of initiating YET activities on a local level. The organizational structure of Institutional Groups varies since it is largely dependent upon the size and character of the institution.

Was the 1951 ASEE move justified? Yes; some of the benefits and advantages derived include the following:

(1) Local and section activities such as programs dealing with professional development, technical subjects, educational methods, etc., have been conducted by Section Committees and Institutional Groups throughout the country.*

(2) YET groups have introduced young members to the Society and to

* Specific information on institutional activities will be presented by Dr. Thomas H. Rockwell, YET-itudes Editor, in a future article in this column.

its activities in general by acting as agencies with which these members may readily identify themselves.

(3) The YET groups have helped to bring the young members of the Society together, both academically and socially. Also these groups have acted as communication channels between individual YETs, between the YET and his institution, and between the YET and the ASEE. (These channels have also been used in conjunction with special surveys conducted by ASEE.)

(4) The membership of ASEE has been increased through the Membership Campaigns conducted by YET groups. During the past year, 1040 new members joined the Society, bringing the total number of members to 8,809.

(5) Programs of special interest to YETs have been conducted by CYET on a national level. Some examples are: Programs for the Annual Meeting, Summer Employment Contact Service, Summer School for YETs, and the Paper Contest. (The last two programs mentioned have been conducted in conjunction with other ASEE groups.)

A Challenge

Although the advantages and benefits derived from the YET movement since 1951 have been considerable, an enormous challenge still exists to expand and improve YET activities at all levels. It is the writer's opinion that the two most important programs for the 1958–59 academic session are Institutional Level Activity and the YET Paper Contest.†

Institutional Level Activity

The growth of the YET movement should be the concern of all young members of the Society, for through this growth these members can create and derive new benefits for themselves, for the Society and for all of engineering education.

The nature of the YET movement is such that its growth depends primarily upon YET activities at a local (institutional) level. The needs and problems of YETs are of such a great variety and specific nature that they can best be handled at this grass-roots level. In fact, this may be the only way that many of them can be handled. Also, because most YETs are less free to travel to Society functions, the local programs may be their only opportunity to be active in the ASEE. These limitations establish an environment that is conducive to the rapid growth of activities on a local level. This opportunity can and should be exploited by all Institutional Groups.

How can YET activity be increased on an institutional level? Perhaps the most direct and presumptuous answer is, "Institutional activities can be increased by the active participation of all young members of the Society in the affairs of their YET Institutional Groups." Beyond this point the question becomes more difficult to answer directly or in detail, for every local group is confronted with a somewhat different set of goals, problems, needs and boundary conditions (i.e., limitations imposed by size and facilities of institutions, etc.). It is, however, possible to answer the question in very general and somewhat indirect terms that would be applicable to all Institutional Groups and their members.

If one permits the assumption that the activity of a group increases as the membership increases, then an obvious move would be to bring new members (new blood) into the Institutional YET groups. These groups already have the necessary "machinery" to increase their membership.

† Since space does not permit elaboration on all but a few of the YET activities, only the most important will be considered.

This "machinery" is in the form of the Society Membership Campaign that CYET and YET groups have been entrusted with by the Society. Since the ultimate responsibility for the conduct of the campaign lies almost solely with the members of the Institutional YET groups, these groups are in an advantageous position to guide new ASEE members directly into their own ranks. Although such a move on the part of these groups may appear to be selfish it should be pointed out that the YETs have been entrusted with this Membership Campaign because most, if not all, of the prospective members of ASEE are *young* teachers. The members of local groups can increase activity at their institutions by helping with this campaign, which is in itself an important activity.

Probably the most important initial step directed towards the increase of institutional activity is to ascertain the objectives of the individual members, which can well serve as a realistic guide for planning effective programs. One specific type of program directed towards this end might include appropriate talks by experienced and successful professional people such as teachers, administrators, engineers and others. However, regardless of the types of programs undertaken, their success and in turn the success of other YET activities will ultimately depend upon the individual member expressing his views, needs and goals to the representative of his Group. Only in this way can the YET programs at all levels best reflect the interests of the young members of the Society.

YET Paper Contest

The communication skills of speaking and writing rank high on the list of self-improvement programs for many YETs. The Paper Contest offers YETs the opportunity to demonstrate and to test their skill of communicating through writing. This contest is a specific activity that is not only directed towards the common goal of self-improvement but is also directed towards encouraging others to establish this goal. For this reason the YET Paper Contest is a ready-made program that can be incorporated into the activities of every Institutional Group. In addition, supplementary programs using the Contest as their central theme can be developed. Such programs have already been presented at some institution. These programs generally feature an experienced writer as the speaker of the evening to give helpful advice and encouragement on writing papers for the Contest.

While the improvement of writing skill is a personal aim in the Contest, the basic motive is to encourage the YET to give serious thought to engineering education and let others know his thoughts. In this way he can help to orient himself in his profession. The YET Paper Contest is therefore unique because it is a singular opportunity for engineering teachers under 36 years of age to express themselves on some subject related to engineering education. The uniqueness presents a definite advantage to the entrant who is sincerely interested in his profession of teaching. This advantage has been borne out by the high quality papers that have been submitted in past years. More YETs should be thinking and expressing themselves about THEIR profession of TEACHING.

Annual Meeting

In addition to conducting the Paper Contest and the Membership Campaign, the CYET will present a program of interest to YETs at the

next Annual ASEE Meeting. This 67th Meeting will be held in Pittsburgh, Pennsylvania on June 15 through June 19.

Summary

The benefits and advantages derived from the YET movement during its short life more than justify its formation by ASEE in 1951. Because this movement is still in its early development, a great opportunity and challenge still exist to expand its membership and activities especially at the institutional level. It is at this grass-roots level that the ingenuity and initiative of all young members of the Society is clearly needed.

To the young members of ASEE, the YET organizations are an "avenue" to active participation in the affairs of the Society. Through this participation the YETs can be of service to themselves, to their institution and to the whole of Engineering Education.

HIGHWAY BRIDGE DESIGN COMPETITION

A steel highway bridge design competition offering 15 awards totaling $44,000 to engineers and college engineering students is being sponsored by American Bridge Division of United States Steel Corporation.

Open to professional and design engineers and to college engineering students, the competition poses the problem of designing an overpass structure in steel to carry a two-lane highway at right angles over a four-lane interestate highway on level ground. The overpass must be designed in accordance with standards developed by the American Association of State Highway Officials and approved by the U. S. Bureau of Public Roads. These standards are entitled "Geometric Design Standards for National System of Interstate and Defense Highways."

Eight awards will be made for winning entries submitted by professional and design engineers, including a top award of $15,000. Other grants in this category will include $10,000 for first honorable mention, $5,000 for second honorable mention, and $1,000 each for five third honorable mentions.

College engineering students will compete for $9,000 in awards, with the first award being $4,000. Also to be given are $2,000 for first honorable mention, $1,000 for second honorable mention, and $500 each for four third honorable mentions.

Complete information on the competition may be secured from American Bridge Division, United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, and from the American Institute of Steel Construction, 101 Park Avenue, New York 17.

Deadline for entering the competition is midnight, May 31, 1959. Entries should be mailed to the Institute of Steel Construction at the above address.

GRAPHIC SCIENCE

Analysis—Synthesis—Communication

Sponsored by the Engineering Graphics Division
Editor: Robert H. Hammond, Major U. S. Military Academy, West Point, New York

REPORT OF THE COMMITTEE ON AIMS AND SCOPE OF ENGINEERING GRAPHICS ENGINEERING DRAWING DIVISION, ASEE

At the present time engineering curricula are being seriously examined and revised. This is necessary, even imperative, because the rapid and continuing expansion of engineering and science compels the inclusion of at least the basic elements of new knowledge into the undergraduate program. In the inexpansible confines of a standard four-year vessel, this new and advanced material is inevitably compressing the even more basic studies.

Many of the mathematical processes can be performed by graphical methods that have a clarity not evident in the abstract symbols of mathematics. For the presentation of ideas and the creation of new forms, the graphic language is unsurpassed. For the analysis and solution of spatial problems graphical methods are universally employed.

Because teachers of graphics come from all major branches of engineering, and because their work cuts across departmental boundaries, their immediate professional interests are centered in the ASEE rather than in any one of the specialized professional societies. It is evident that these teachers touch the lives of about 65,000 students in ECPD accredited colleges in the first formative year of their education, more than any other scientific subject with the exception of mathematics.* With this grave responsibility in mind, and with full consciousness of our obligation to keep our work abreast of the times, we, members of the Engineering Drawing Division of ASEE, submit the following broad statements of policy as a guide for future progress:

1. It is our purpose to teach the principles of communicating ideas and solving problems by graphical means. More specifically, we are teaching the student to comprehend and describe spatial concepts; to exercise his ability to think imaginatively, analyze, and synthesize; to develop habits of sequential thinking, orderly problem approach, and engineering procedure.

2. An objective of extreme importance in graphics courses is to give competence in clear and accurate communication, for the major function of the engineer is to conceive ideas, apply his knowledge of science to creative design, and transmit his conceptions to draftsmen or technicians.

3. Graphics courses present a remarkable opportunity for developing the creative ability of the student. Experimentation in the use of special projects with this objective in mind is going forward in many institutions and is heartily encouraged.

4. Graphics is a science basic to the engineering function and should be taught as a science, not as a skill. It is our hope that the proper authorities will give some thought to this concept and consider the classification of graphics as an engineering science for accreditation purposes.

To accomplish the above objectives a reasonable amount of time in the curriculum is necessary. Different institutions, in different geographical locations, with different objectives logically could vary slightly in requirements. It is our

* JOURNAL OF ENGINEERING EDUCATION, March 1957, p. 624.

opinion that the minimum point has been reached in most institutions and that there is an urgent necessity to guard the place of graphics in the curriculum lest sound engineering education be jeopardized.

Addendum

Whereas, the term "Engineering Graphics" characterizes more accurately the scope of our work which includes graphic analysis and problem solving as well as the description of objects for manufacture; therefore

We recommend that the name of the *Engineering Drawing Division* of the American Society for Engineering Education be changed to the *Engineering Graphics Division* of the American Society for Engineering Education.

Prof. Carson P. Buck, Syracuse University
Dean Jasper Gerardi, University of Detroit
Major Robert H. Hammond, U. S. Military Academy
Prof. Frank A. Heacock, Princeton University
Prof. Albert Jorgensen, University of Pennsylvania
Prof. Raymond A. Kliphardt, Northwestern University
Prof. Matthew McNeary, University of Maine, Chairman
Prof. James S. Rising, Iowa State College
Prof. B. Leighton Wellman, Worcester Polytechnic Institute

June 16, 1958

Editors Note: The change of name recommended in the addendum of this report was approved by the Division on June 17, 1958 and by the ASEE on June 20, 1958.

FLUOSOLIDS SYMPOSIUM AT ARIZONA

The University of Arizona College of Mines will offer an educational program and symposium on "The Application of the FluoSolids Reactor to the Mineral Industry" early in 1959, according to an announcement by Dr. James D. Forrester, dean of the UA College of Mines.

The first part of the educational program will be held for five days, from Monday, Feb. 23, through Friday, Feb. 27. It is designed for engineers who will have control or be directly or indirectly connected with the operation of a FluoSolids reactor. The UA College of Mines four-inch FluoSolids reactor—the only one owned by a college of mines for instructional purposes—will be used for laboratory instruction. Fee for this educational program will be $30.

A symposium will form the second part of the program, on Monday and Tuesday, March 2–3. It will be devoted to technical papers, a panel discussion, and a field trip. A $10 symposium fee will include transportation and one meal during the field trip.

Additional information may be secured from Professor Sigmund L. Smith at the College of Mines, University of Arizona, Tucson. The program is planned to follow shortly after the annual national meeting of the American Institute of Mining, Metallurgical and Petroleum Engineers (AIME), in San Francisco from Feb. 15–19.

A MORE EFFECTIVE APPROACH TO TEACHING ENGINEERING GRAPHICS

CARSON P. BUCK

Chairman, Department of Engineering Drawing, Syracuse University

Recommended by the Engineering Graphics Division

With the development of the concept of the engineer as being more of a professional person and less of a technician, there has been a diminishing need for courses that develop manual skills. It is small wonder then that some degree-granting departments, faced with an ever-increasing desire for more time in their crowded curricula, have considered that their prospective students could do with less drawing where it appeared evident that the development of instrumental skills was still the major objective or where the course content seemed too concentrated in one graphics area.

Engineering Graphics teachers have been justly concerned with the curtailment of time devoted to Engineering Graphics in the engineering curriculum, and they have implored degree-granting departments to cease and desist. To an extent the approach of many teachers has been one of constant justification of that which is presently being taught. It might be compared to a procedure of constantly mending an old blanket that is rapidly becoming a patched-up baby blanket. It would seem that it would be more sensible to reevaluate the whole fabric and determine what are the present needs of the engineer as well as the engineering student in the field of graphics.

At the outset in our evaluation it is a foregone conclusion that engineers have a need for graphics. The amount of this need varies, but there is a fundamental amount that every engineer should have. In the design of an effective course, we must give serious consideration to the fact that a substantial percentage of freshmen and sophomores are not necessarily employed in the field of their original choice. Any basic graphics course should, therefore, be broad enough to satisfy the basic needs of all curricula without overemphasis on any one particular area. Currently, for example, some courses have a predominance of topics of primary interest to mechanical engineers with supplementary topics or problems introduced here and there in an attempt to justify the teaching of the courses to other engineering students.

What should be the content of an engineering graphics course designed to serve all engineers? Basically it would appear that it should have the following general objectives in terms of needs of the engineer and the engineering student:

1. A basic knowledge of the various methods of representation. This implies an ability to read drawings that he may encounter. Fundamentally it means a working knowledge of orthographic projection, though this is only the necessary core of knowledge of representation. Others would include pictorials, charts, and diagrams.

2. Ability to solve problems graphically.

   a) Knowledge of the use of orthographic projection and the principles of descriptive geometry in solving spatial problems.

b) Knowledge of fundamental graphical mathematics, basic types of graphs, nomography, alignment charts, etc. and an appreciation of their use in the solution of problems.
c) Experience in creative engineering in the solution of problems involving original design [1] or redesign.
d) In the solution of problems, an appreciation for a logical approach in reasoning out the solution. The "engineering method."
e) An appreciation, as needed, of accuracy, and thereby of neatness, in the solution of problems.

3. Ability to present his ideas to management or to laymen through use of the above.

4. The engineer is not likely to be a draftsman, but he may be called upon to supervise draftsmen, and he should be able to translate ideas to paper in the form of sketches or more carefully executed layouts. He will therefore need:

a) An ability to sketch.
b) An ability to use drafting instruments.

5. He will be expected to annotate his work clearly and should therefore have an appreciation for a neat, clearly legible form of lettering.

These objectives can be accomplished by a course that would cover the following four general areas:

I. Fundamental knowledge.
  A. Technique of sketching and lettering.
  B. Basic theory of projection.
II. Methods of representation.
III. Solution of engineering problems.
  A. Applications involving projection theory.
  B. Applications involving other analytical problems.

This material can be given under one integrated course or a combination of a basic course and a course in descriptive geometry. The author favors the integrated course as it is felt that it represents the more economical approach, time-wise as well as logically, to the presentation of the needed knowledge of engineering graphics.

It should be noted that the proposed course can and does include a considerable amount of material which previously formed an entire basic engineering drawing course. However, it is assumed that many of the topics formerly covered rather elaborately would be drastically curtailed or eliminated from a basic course. Time now spent on such topics as fasteners, intersections, and developments, for example, could be considerably reduced. Such specialized topics as structural drawing could be eliminated.

Teaching Methods

In presenting courses in engineering graphics, the current procedure in the majority of schools has been to provide either one hour of lecture and six hours of laboratory per week, or six hours of laboratory per week which includes lecture time. So much carefully supervised laboratory time has a tendency to curtail individual initiative on the part of the student and has developed an over-emphasis on technique. Graphics could be presented in a manner similar to that in which many other engineering courses are handled. For example, it seems feasible to present a graphics course in two one-hour lecture periods and

[1] The use of the term "design" in this article is not intended to be limited to the possible connotation in connection with the preparation of working drawings, but rather to the use of any phase of the graphics language that may contribute to the creation or development of any engineering project.

one two-hour recitation period per week. This additional lecture time would permit broader coverage of essential topics.

The recitation period could be used when necessary for instruction in the fundamentals, proper use of instruments, and techniques of freehand sketching. Its primary use would be as a problem or discussion session. The student would be expected to work assigned problems based on lecture and text material on his own, outside of class. Required delineation of the problems would be by sketching, or instruments, or a combination of both depending to some extent on the discretion of the student and on the accuracy desired. Grading emphasis would be primarily on quizzes and examinations. Such quizzes and examinations would vary from tests of written knowledge of subject matter to graphically executed solutions of problems, much as is presently being done.

How much training should there be in technique? Ability to use instruments correctly and properly is one thing; ability to turn out a "beautiful" finished drawing is something else. Accuracy is necessary for the engineer in the solution of his problems. Accuracy generally implies, or is generated by, neatness. Training beyond this point in the use of instruments is superfluous and unnecessarily time-consuming.

The same is true of lettering. The engineer should be able to letter clearly and this should imply a certain neatness. However, very much training beyond the ability to do a reasonably neat job with the Single-stroke Gothic alphabet is a waste of time for two reasons: professionally, he doesn't need it, and "beautiful" finished work is a matter of constant practice, both for lettering and instrumental work. A concentration of six hours per week for two semesters in the freshman year not followed by considerable continuing practice in the next three years does not give us a graduating engineer who is a "skilled" draftsman—even should we desire one. It would seem that these facts make the argument in favor of teaching a high degree of skill to freshman engineers an unrealistic one.

Summary

Engineering Graphics plays an extremely important part in the engineer's daily life as an effective tool of "communication, analysis, and synthesis." [2] The prospective engineer has a natural ability for visualization, a part of the creative ability to design. We must aid in the development of these abilities. In doing so we must be cognizant of the many ways in which the professional engineer, in contrast to the technician, will and should make use of his graphic language in conveying ideas and solving problems, and we must not become bogged down by the temptation to give emphasis to the development of drafting skill. We can and should accomplish these goals in a more effective and efficient manner than most schools are now doing. Graphics courses developed with these concepts in mind should readily be classified as essential engineering sciences.

[2] From the report of the Committee on Evaluation of Engineering Education, ASEE, June 15, 1955.

NATIONAL SCIENCE FOUNDATION AID FOR EDUCATION IN SCIENCE AND ENGINEERING

A series of programs designed to aid the teaching of science and engineering in colleges and high schools has been announced this fall by the National Science Foundation. As a result of legislation passed by the 85th Congress, NSF has funds for the support of programs aimed at directly improving the teaching of science and engineering in college and at improving the training of teachers in these areas in both college and high school. Rapid action by schools wishing to participate is imperative, because deadline dates for proposals are, for the most part, this winter.

Six specific programs have been announced thus far:

Research Participation Programs for Teacher Training

Universities, colleges, and other nonprofit institutions with appropriate research facilities may submit proposals for research participation programs for teacher training. These should be designed to provide meaningful research experience during the summer months for teachers of science, engineering, and mathematics in high schools and small colleges under the tutelage of experienced researchers. NSF will provide support for stipends, travel, expendable supplies, secretarial and administrative expenses, and other direct costs. Deadline for proposals for this year was December 1.

Undergraduate Research Participation Programs

Colleges, universities, and research institutions may apply for grants providing properly qualified undergraduates majoring in the physical, biological, mathematical, and engineering sciences with opportunities to participate in research projects under experienced scientific investigators. Programs may operate during the academic year or during the summer.

The Foundation will support undergraduates at prevailing campus rates of pay for a maximum of 400 hours per student. Expendable supplies and secretarial and administrative expenses directly attributable to this student training will also receive support.

Comprehensive proposals for all participating departments within an institution should be received by the Foundation by December 15, 1958, for programs beginning in the summer of 1959.

Predoctoral and Postdoctoral Fellowships

Applications are being accepted in two fellowship programs for advanced study in the natural sciences: (1) a predoctoral fellowship program for which college seniors and graduate students may apply; and (2) a postdoctoral fellowship program.

Stipends vary with the academic status of the Fellows. First-year Fellows—students entering graduate school for the first time or those who have had less than one year of graduate study—will receive annual stipends of $1800. Fellows who need one final academic year of training for the doctoral degree will receive annual stipends of $2200. Fellows between these two groups will receive stipends at the rate of $2000 annually. The stipends for the regular Postdoctoral

Fellows will be $4500 per year. Dependency allowance of $500 per annum for spouse and for each dependent child will normally be available. Tuition and laboratory fees and limited travel allowances will also be provided.

Applications may be obtained from the Fellowship Office, National Academy of Sciences-National Research Council, 2101 Constitution Avenue, N.W., Washington 25, D. C. The closing dates for the receipt of applications are December 22, 1958, for postdoctoral applicants and January 5, 1959, for graduate students working toward advanced degrees in science.

Cooperative Graduate Fellowships

In a new program of Cooperative Graduate Fellowships in support of the study of graduate students in the sciences and engineering, candidates will be required to take a nationally-administered examination designed to test scholastic aptitude and scientific achievement.

In this first experimental year of operation, applicants may apply to study at one of 115 designated colleges and universities—those which have awarded an average of at least one doctoral degree annually over the last four years of record in the disciplines covered. Applicants will apply through the institution of their choice and will be initially evaluated by the faculty.

Tenures of nine to twelve months are optional with the Fellow. Fellows will receive a basic annual stipend of $2200. Modest supplemental support may be extended by the institutions themselves to encourage Fellows in this program to undertake limited teaching responsibilities during their fellowship tenure. In addition, the Foundation will provide to each institution, in lieu of tuition and fees, a fixed amount for each Cooperative Graduate Fellow at that institution.

Application material can be obtained from the Graduate Dean of a participating institution or from the Fellowships Section, Division of Scientific Personnel and Education, National Science Foundation, Washington 25, D. C. Applications must be submitted to the Graduate Dean of the participating institution of the applicant's choice by December 15, 1958.

Further Information

Directions for preparing proposals and any further information desired may be obtained from Special Projects in Science Education, Division of Scientific Personnel and Education, National Science Foundation, Washington 25, D. C.

A SUMMARY OF RESEARCH CAPABILITIES

In Engineering Colleges

This summary is taken from *A Survey of Research in the Nation's Engineering Colleges, Capabilities and Potentialities, July 1956 to June 1957.* This survey was made by ASEE's Engineering College Research Council under the sponsorship of the National Science Foundation. The results were first published in June 1958. The complete report may be obtained from the Office of the Secretary of the Society in Urbana, Illinois, for 25¢.

More than one-half of the engineers in the nation's colleges and universities are qualified researchers of high caliber, and nearly all could contribute to an all-out research program. Many divide their time efficiently between academic duties and research, particularly applied research, but collectively the group represents a latent potential which, with financial assistance, could contribute significantly to the country's basic engineering research.

Of a total of 6,501 permanent, full-time research and academic engineers, 51 per cent have demonstrated their research abilities. Twenty-one per cent have unproved potential, 14 per cent have supporting potential, and the remaining 13 per cent have no potential. These percentages for the entire group also represent fairly well the distribution of research talent at most individual schools. Eliminating engineers with no measurable research potential, 87 per cent or 5,647 are qualified to contribute in some capacity to any major university research program.

Between July 1956 and June 1957, a total of 1,668 equivalent man-years was spent by 6,428 engineers on sponsored research. The latent capacity of the same group for the same twelve-month period was 549 equivalent man-years. This is an estimate of the time that the group could have spent on more research without interfering with teaching, committed research, committees, and other responsibilities, if funds had been available. The funds which could be absorbed to bring this group up to full research potential are estimated between $10 and $25 million. The minimum is based on an arbitrary, but often used, value of $18,000 per research man-year, and the maximum on the assumption that funds would be increased 30 per cent, or by an amount equivalent to the ratio of latent capacity to present engineering research activity, both in man-years. The expanded effort would have to be implemented with new equipment and facilities, and this—with today's emphasis on computers, high-temperature and low-temperature laboratories, isotope laboratories, and nuclear reactors—would require an additional investment estimated at $200 million. Much of this expenditure would serve the dual purposes of instruction and research.

During the twelve months of fiscal 1956–1957, 108 Engineering College Research Council member schools expended $86.4 million on engineering research. At $53.4 million, government military was the largest single sponsor, providing 62 per cent of the total. Government nonmilitary accounted for $10.6 million; industrial contract, $11.5 million; self, $7.1 million; industrial grant, $2.7 million; and other sources, $1.1 million. Figure 1 shows a general summary of the survey findings and the relative geographic distribution.

The survey, examining a major seg-

NORTHEAST
NORTHCENTRAL
SOUTH
WEST
Enrollment – Grad Students (Total 25,931)
Engineering Personnel (Total 6681)
Schools Visited (Total 108)
Research Expenditures (Total $864 Million)
Latent Capacity (Total 549 Man-years)
Enrollment – BS, MS, PhD (Total 277,000)
Engineering Research Activity (Total 1668 Man-years)

ment of the nation's academic engineering institutions, found that most of them had liberal research policies and generally suitable working arrangements between research and teaching divisions. It appears that conditions for research in these schools are as conducive to optimum efforts as those that would be found in any other organization similarly engaged in research. This is particularly true for basic research. Financial demands force many schools (approximately 75 per cent) to operate heavily in the area of applied research. But this balance between basic and applied research would swing very quickly and strongly towards basic (probably to 65 or 70 per cent) if engineering administrators had their way. Important also would be the reducing effect that more outside funds earmarked "basic" would have on the time and effort now being spent on applied research.

Consulting, summer research, contractor restrictions, increased enrollments, and the environment of individual schools have varying influence on research activity in the nation's colleges. It is doubtful, however, that they would have any appreciable effect on latent potentialities. Some schools cite dollar figures in support of their effort to bring staff and research together during the summer months—away from consulting, back from industry—to help increase their research activity.

More plans of this kind, bolstered by increased NSF funds (available under conditions slightly different from those that exist today), plus more equipment dollars, would expand college engineering research by 10 to 20 per cent.

TWO FEDERAL AGENCIES ANNOUNCE INCREASED STIPENDS FOR FELLOWSHIPS

An increase in stipend rates for research fellowships has been announced by two Federal agencies, the National Science Foundation and the Public Health Service.

The increased stipends, now available for future fellowships, put into effect the recommendations of senior scientists in training centers throughout the nation, Dr. Alan T. Waterman, Director of the National Science Foundation, and Dr. Leroy E. Burney, Surgeon General of the Public Health Service, said. A survey of these scientists supported this increase as necessary to sustain the productive research training programs of the two Federal agencies in non-Federal, non-profit research institutions.

The stipends from both agencies at the predoctoral level will be increased by $200. This will raise the stipend to $1,800 for the first year, $2,000 for the intermediate year, and $2,200 for the terminal year. Predoctoral allowances have been increased to permit $500 for each dependent. Other allowances such as certain travel expenses remain unchanged.

The new stipends for both agencies at the postdoctoral level will be $4,500 for the first year and $5,000 for the second year. In addition, postdoctoral allowances have been increased to provide $500 for each dependent. Other allowances for certain travel expenses and research supplies will remain unchanged.

ANNOUNCEMENT OF AWARDS

Nomination forms for the awards listed below and a convenient form for summarizing information may be obtained from the Committee Chairman or from the Secretary of the Society, W. Leighton Collins, University of Illinois, Urbana, Illinois.

LAMME AWARD

The Lamme Award consists of a gold medal and bronze replica bestowed annually upon a distinguished engineering educator for excellence in teaching and contributions to research and technical literature; achievements which contribute to the advancement of the profession; and engineering college administration. The Lamme trust fund was established in memory of Benjamin Garver Lamme in 1928.

Preliminary nominations should be submitted by letter to the Chairman of the Lamme Award Committee, J. H. Sams, Clemson College, Clemson, South Carolina, on or before January 1, 1959. Additional information should be mailed by February 1, 1959.

VINCENT BENDIX AWARD

This gold medal and citation are presented for outstanding research contributions, either in original thought or administrative leadership, to a staff member of an engineering college in the United States. The Award was established through the efforts of the ECRC and the Bendix Aviation Corporation.

Nominations should be submitted on or before March 1, 1959, to Dean Lee H. Johnson, Bendix Award Committee Chairman, College of Engineering, Tulane University, New Orleans, Louisiana.

CURTIS W. McGRAW RESEARCH AWARD

Primarily intended to recognize an outstanding young member of an engineering college research staff in the United States, the Award is limited to nominees who will be under 40 years of age on June 30, 1959. This prize, sponsored by ECRC with the assistance of the McGraw-Hill Book Company, consists of $1,000 in cash and an engraved certificate.

Nominations should be submitted to Dean W. J. Seeley, Curtis W. McGraw Research Award Committee Chairman, College of Engineering, Duke University, Durham, North Carolina. March 1, 1959, is the final date.

GEORGE WESTINGHOUSE AWARD

This award was established by the Westinghouse Educational Foundation as an annual award to young engineering teachers of outstanding ability to recognize and encourage their contributions to the improvement of teaching methods for engineering students. It consists of $1,000 in cash and an engraved certificate. Nominations should be sent to the Chairman of the Committee, E. F. Obert, University of Wisconsin, Madison, Wisconsin, by March 1, 1959, and they must be accompanied by documentary evidence supporting major statements and claims.

JAMES H. McGRAW AWARD

Each year the Technical Institute Division presents to an outstanding contributor to Technical Institute education this award. Established by the McGraw-Hill Book Company, the award consists of $500 and an engraved certificate. Nominations are to be submitted to the Chairman of the James H. McGraw Award Committee, R. Warren Marsh, Erie County Technical Institute, Buffalo, New York, by March 1, 1959.

COOPERATIVE EDUCATION DIVISION BULLETIN

New Officers Elected

John L. Cain, Director, Cooperative Program, Virginia Polytechnic Institute, succeeded Roy L. Wooldridge as Division Chairman. Jack W. Harkey, Southern Methodist University, was elected Vice-Chairman and Michael J. Vaccaro, National Aeronautics and Space Administration, was elected Secretary. New members elected to the Board of Directors include Ralph G. Owens, Dean, Illinois Institute of Technology, and William H. Merchant, Army Ballistic Missile Agency.

1959 Mid-Winter Meeting in Chicago

Tom Brinkmann, formerly of Northwestern University, and Ray Meade, Illinois Tech, are joint hosts for the Mid-Winter Meeting in Chicago. Tom recently resigned his post at Northwestern University and is now Secretary and General Manager of Marking Device Association, Evanston, Illinois. The meeting will begin Wednesday evening, January 7 and will conclude Friday afternoon, January 9. The sessions are indicated below:

Wednesday evening, January 7
- Informal get-together
- Board of Directors meeting

Thursday morning, January 8
- Call to order
- Welcoming speech
- Report of Illinois Tech, Marquette and Purdue joint educational industry meeting

Thursday afternoon, January 8
- Coordinators workshop

Friday morning, January 9
- Business meeting
- Workshop reports—4 or 5 workshops sponsored by Chicago companies including co-op student participation

Friday afternoon, January 9
- Tour—informal bus trip to Museum of Science and Industry

All working sessions will be held at Del Prado Hotel, located on the Lake at about 5000 South.

A College Meets a Challenge

Fenn College, Cleveland, has produced a motion picture entitled "A College Meets a Challenge." This film is more than the story of Fenn College—it is a story of a community (Cleveland) and a college (Fenn) working together to face their challenge. The film features scenes of actual on-the-job experiences of students in Fenn's Cooperative Education Plan. Details regarding the film are available from Max Robinson, Dean of Cooperative Education, Fenn College.

Industry Reading Program at Drexel

Recognizing the growing demand for broadening educational opportunities for engineering students in our country, the Engineering Faculty at Drexel Institute of Technology has adopted an Industry Reading Program. Dr. Robert C. Disque, Dean Emeritus, Professor Emeritus of Electrical Engineering, is the able administrator of the Program for the College of Engineering. This program requires all engineering students to devote about 60 hours in each of the seven cooperative periods to study and reading under supervision in the liberal fields of learning.

The first two periods are given to readings in English and American Literature. The third is devoted to American History, and the remaining four to subjects related to the upper class elective system, including such fields as economics, history, constitutional law, literature, philosophy, current events, and semantics. According to Dean Disque—"To allow students being prepared for a profession to be intellectually idle through 21 months of the most impressionable period of their lives is to miss an unmatched opportunity. . . . Indeed this program can be a convincing answer to the persistent criticism that our engineering curricula are too narrow."

Professor Robert B. Auld, Fenn College, presented a detailed analysis of *Home Reading for the Co-op During His Work Period* at a recent meeting of the Division. In concluding his remarks, Professor Auld commented—"It really seems to me that you (Dean Disque) have made a contribution to American education second only to that made by Dean Schneider when he introduced the Co-op Plan. If your plan is adopted universally by co-op colleges . . . as I sincerely hope it will be . . . it should enable them all to send forth their graduates with the best rounded education obtainable anywhere."

National Co-op Student Fraternity Formed

Spearheaded by students at Cornell, M.I.T. and Rensselaer, a National Association of Cooperative Students has been created. The purposes of this fraternity, Mu Rho Chi, are to make known the aims of cooperative education, to serve as a means of increasing the benefits of cooperative education to both the student and cooperating industry, and to serve as a means of uniting the members of the Cooperative Program.

Students active in founding Mu Rho Chi include Peter Scharfenberg, Rensselaer Polytechnic Institute; Paul Rosenberg, Cornell University; and Al Martz, Massachusetts Institute of Technology. Faculty advisors for the Co-op Program at these schools are Professor E. M. Strong (Cornell), Professor S. B. Wiltse (R.P.I.), and Professor E. W. Boehne (M.I.T.). Its founders believe that Mu Rho Chi represents the best means of explaining and publicizing the advantages of cooperative programs to high school and college students, guidance counselors and parents.

Publications Committee Appointed

An *ad hoc* Publications Committee including Professor E. W. Boehne, M.I.T.; Dean Max Robinson, Fenn College; and Mr. Marshall Miller of duPont Company; and Michael J. Vaccaro, NASA, as Chairman has been appointed. The Committee will investigate the role of the Cooperative Education Division in publicizing the aims and value of Cooperative Education. It is expected the Committee will make its report of its findings and recommendations at the Division's Mid-Winter Meeting at Chicago.

HAROLD A. BOLZ DEAN AT OHIO STATE

The office of the dean of the College of Engineering at the Ohio State University has been reorganized effective Oct. 1. The reorganization resulted from the promotion in March of former Dean Gordon B. Carson to the University vice presidency and of former Associate Dean Harold A. Bolz to the deanship July 1.

Three new promotions in the dean's office were announced by the University Board of Trustees in September. Prof. Robert S. Green, professor of welding engineering and executive director of the Engineering Experiment Station, was named associate dean of the College and will be responsible for the business affairs and coordination of research in the College. He will continue as executive director of the Experiment Station and professor of welding engineering. He will also serve as acting dean in the event of the dean's absence.

Marion L. Smith, associate professor of mechanical engineering, has assumed the title of associate dean with responsibility for curriculum development, administration of scholarships and awards, and relations with alumni, industry, professional societies, and the public. He will retain his academic rank in the department of mechanical engineering.

Paul T. Yarrington, associate professor of engineering drawing, became assistant dean, and will be responsible for relations with high schools, prospective students, and freshmen, and will coordinate the college counselling program and selective service matters.

REPORT OF THE REPRESENTATIVES OF ASEE
on the Council of the
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

ASEE has been an affiliate of the American Association for the Advancement of Science for several years. As such, it is entitled to two representatives on the AAAS Council, and serving in this capacity are I. P. Orens and Howard A. Meyerhoff. It is their function to see that the interests of engineering education are appropriately presented at Council and other meetings of the Association, to serve as members of the Section M (Engineering) Committee, and to report, to ASEE, Association activities of special interest and concern to engineers.

The AAAS has a total membership of approximately 50,000, of whom a scant 5 per cent consists of members of the engineering professions. The Association's major activities consist of a single annual meeting, held each year in the period between Christmas and New Year's, and the publication of the weekly magazine *Science*. Although its activities are administered in behalf of all scientists and engineers without regard to field of specialization, the organization of its annual meetings is entrusted to sections representing the several fields. There are eighteen sections covering the natural and medical sciences, engineering, and the social and economic sciences.

The section on engineering is designated by the letter "M." It is run by a section committee composed of an elected chairman (who is also a vice president of the Association), an appointed secretary, four elected members at large, and representatives of the nineteen engineering societies (including ASEE) formally affiliated with the Association.

For the past several years, Clarence E. Davies (ASME) has been chairman of Section M, and E. Paul Lange (EJC) is serving as secretary. Under the chairmanship of Mr. Davies, the Section Committee has met at frequent intervals and has endeavored to arrange programs either of specific interest to engineers or, more commonly, of general interest to the public. It has also sought to explore fringe areas in which engineering and the scientific disciplines overlap. It has consistently cosponsored the annual Conference on Scientific Manpower, which has been a feature of the AAAS annual meeting for several years. Next December, when the AAAS will meet in Washington, the nature of physical measurements by which science and engineering operate in the United States will be the major topic of interest.

Although it is conceded that the timing of the AAAS annual meeting is bad, it is unfortunate that the profession has not supported its section or made greater use of the opportunities it affords for publicizing engineering and for cooperative activities with scientists. The Association's annual meeting is the only regularly scheduled convention where scientists and engineers can—and should—meet for the consideration and discussion of common interests and common problems. Last December, in Indianapolis, only 99 engineers registered in a gross attendance of 3684.

Of general interest to the profession was the so-called 1958 Parliament of Science, authorized by the Council in December and held in Washington, D. C., March 15–17, 1958. The five principal topics considered at this

conference were: The Support of Science; Organization and Administration of Science in Government; Communication Among Scientists and Communication of Scientific Ideas; The Selection, Guidance, and Assistance of Students; and The Improvement of Teaching and Education. All these subjects are of direct concern to the engineering profession, but it will be noted that the word "engineering" is not mentioned once in any of the topics. The deliberations of the Parliament are reported in the April 18, 1958, issue of *Science* (pp. 852–58), and one will look very hard indeed to find engineers or engineering mentioned in the report. Yet, according to National Science Foundation figures, 25.7 per cent of the nation's engineers are engaged in research and development. From a simple numerical standpoint, the profession has as large a stake in financial support, organization and administration, communication, student guidance and assistance, and the improvement of teaching as all the scientific professions. Unfortunate as the omission of engineering was from the deliberations of the 1958 Parliament of Science, it reflects the low level of participation and interest that engineers have taken in the AAAS and its activities.

Continuing AAAS programs of interest to the engineering profession are the Science Teaching Improvement Program and the work of the Committee on the Social Aspects of Science. The former, under the direction of Dr. John Mayor, is primarily concerned with the recruitment and training of new teachers and the retraining of men and women already teaching high school in mathematical and scientific subject matter. A special effort is being made to induce college and university departments of mathematics and science to offer courses for high school teachers that will count for graduate credit, so that, in working for the Master's degree, they will not be forced to take courses in education, educational psychology, and related subjects. The Committee on the Social Aspects of Science has already held a symposium on the radiation hazard and will eventually give its attention to such matters as air and water pollution.

Last year, the AAAS raised its dues from $6.50 to $8.50, and it also merged its two magazines—*The Scientific Monthly* and *Science*. At present, the weekly magazine *Science* contains little that pertains to engineering, but it offers an outlet for the quick publication of short contributions, and the profession should make greater use of it. Editorial policy favors diversification of subject matter, but engineers and physical scientists contribute altogether too little to its pages. The editor will welcome brief technical items and somewhat longer feature articles of general interest. The Association's journal, like its programs, is a direct reflection of participation on the part of the several disciplines that compose the Association. At present, *Science* is overloaded with articles on medical biology, organic and biochemistry, and biology in general. The engineering profession has it in its power to change its content.

The President of the Association is Wallace R. Brode, formerly Assistant Director of the National Bureau of Standards, but currently in the Department of State. President-elect for 1959 is Paul E. Klopsteg, Associate Director of the National Science Foundation. Dr. Brode is a chemist of such eminence that he has served as President of the American Chemical Society. Dr. Klopsteg is a physicist and is the former Director of the Central Scientific Company, Chicago.

Irving P. Orens
Howard A. Meyerhoff

MEETING OF EXECUTIVE BOARD

Chicago, Illinois, September 7, 1958

W. LEIGHTON COLLINS, *Secretary*

Note: By action of the Executive Board only abstracts of the minutes of its meetings and meetings of the General Council are published in the JOURNAL. Anyone wanting a complete copy of the minutes may obtain them by writing to the Office of the Secretary.

The large number of new programs coming up for implementation constituted the most significant items of business. They indicate the current virility of the Society and the desire of the membership to improve engineering education and the functioning of the Society. Among the significant actions are:

1. Authorization to the Nuclear Committee to proceed with negotiations with the Atomic Energy Commission for Summer Institutes on nuclear energy for 1959.

2. The development of a plan for sponsorship of summer institutes by Sections was referred to the Committee on Relations with the National Science Foundation, R. H. Roy, Chairman. The general NSF plan is for the institutes to be on a regional basis, and for attendees to receive nominal payments. Various areas of science have sponsored programs in the past, but so far the engineering sciences have not been included. It was believed that teachers at institutions offering pre-engineering curricula, in particular, could benefit greatly from the institutes.

3. A general plan for summer schools for YET's was endorsed and submitted to the Committee on Relations with NSF for development. The general plan is for a two-week program, one week to include the annual meeting of the Society.

4. Approval was given to the Humanistic-Social and English Divisions to plan a follow-up conference on General Education in Engineering, to be held in conjunction with the 1959 annual meeting in Pittsburgh.

5. The request of the Electrical Engineering Division to co-sponsor, with the Case Institute of Technology, a workshop on Electrical Properties of Materials to be held in the first week in September of 1959 was approved.

6. The Planning Committee was requested to develop for the Monday afternoon general session of the 1959 annual meeting a stimulating program on those new areas of science influencing engineering education. Since the inclusion of these areas in the activities of the Society means cutting across traditional divisional lines, the Committee also was allocated time on the Tuesday morning general session if it wished to present plans for a reorganization of the Society's structure.

7. General plans for the eight-man team to go to Russia to study engineering education were reviewed. It is expected that the team, under the chairmanship of Past President F. C. Lindvall, will go to Russia in November after a similar Russian delegation has visited the United States. The approach to the study is the same as that for an ECPD accreditation visit, and funds have been requested from the NSF.

Some of the discussions did not lend themselves to positive plans of action, as follows:

1. Should CDEF repeat its salary and earnings study?

2. Should there be an evaluation study of technical institute education?

3. Should EJC undertake a "transportation study"? It was agreed ASEE should nominate members for consideration for appointment to an exploration committee.

4. What is the next step regarding federal aid to education? The spokesmen for engineering education were opposed to scholarships, and they were deleted from the 1958 bill; pleas were made for fellowships, and they were included.

5. Should there be an international organization on a continuing basis to discuss engineering education? UPADI is endorsing a proposal for a Pan-American conference in 1960, EUSEC has had some highly valuable conferences, and many other countries have shown interest in what is going on in this country.

The report of the Secretary indicated that as of 1 September, 1958 the membership totals were:

Institutional, Active—	
ECAC and ECRC	111
ECAC only	40
Associate	9
Affiliate	50
Industrial	148
Individual	8819

List No. 2 of applicants for individual membership containing 52 names was approved. Also, the requests for affiliate membership of Hillyer College of the University of Hartford and North Idaho Junior College were approved.

The report of the Treasurer included comments on the audit for the year 1957–58, which will be printed in the February 15—Yearbook issue of the JOURNAL OF ENGINEERING EDUCATION. Income for the year was $108,332.95 and expenses $101,518.40, giving a net income of $6,814.55 for the year. It was voted that an additional $5,000 be added to the reserve for emergencies, bringing that fund up to $70,000.

ADVANCED INDUSTRIAL ENGINEERING INTENSIVE COURSES AT WASHINGTON UNIVERSITY OF ST. LOUIS

Washington University of St. Louis will offer in January a series of three Advanced Industrial Engineering Intensive Courses: Advanced Quality Control and Statistics, Advanced Motion and Time Study, Linear and Mathematical Programming. These courses are offered by the Department of Industrial Engineering and the University College of Washington University, St. Louis, Missouri, January 26–30, 1959. They are intended for personnel desiring to supplement their basic training in the areas with knowledge of the more advanced techniques and newest material available in each one of the fields.

For further information write to University College, Washington University, St. Louis 5, Missouri.

REPORTS OF ASEE OFFICERS

For 1957–1958

REPORT OF THE SECRETARY

W. LEIGHTON COLLINS

1. *Finances.* The pro-forma statement indicates that receipts will exceed the budget by about $1,200 and that disbursements will be about $1,100 less than the budget. Thus, a favorable balance of about $2,400 is indicated for the year's operations; this does not include the $2,000 budgeted for the reserve for emergencies. The anticipated increases in income over the previous year materialized, and offset the increases in disbursements. The favorable balance results primarily from the advertising income being about $1,200 larger than the amount budgeted, the individual dues income being about $1,400 above the budgeted amount, and the increase of almost $1,800 in subscriptions. The increase in advertising income is due to the increased rates, for the amount of advertising decreased about 1.2 pages per issue.

It is recommended that if the audit is in reasonable agreement with the pro-forma statement that $5,000 be transferred from the general fund to the reserve for emergencies; this amount includes the net profit for the year and the budgeted $2,000, with the remainder coming from the reserve for special projects, which amounts to about $5,000. From another point of view, this transfer is nothing but putting into the reserve the year's net gain and the interest on the money already in the emergency reserve fund.

2. *Budget for 1958–59.* The proposed budget for $114,650 is about $9,000 above that for last year, about $10,000 above last year's disbursements, and about $7,500 above last year's receipts. The increase in receipts results primarily from the growth of individual membership and on a nominal increase for next year in both individual and industrial memberships. Advertising income is estimated to remain about the same as for the current year. The increases in disbursements are primarily to meet cost levels established during the current year, for a modest increase in salaries for some of the office staff, for furniture and equipment for the office of the Editor, and for an increase of $3,000 budgeted for the reserve for emergencies.

3. *Individual Membership.* During the fiscal year, to the first of June 1,040 new members joined the Society, bringing the total membership as of June 30 to 8,809. After the appropriate drop action on 184 members the total will be 8,625. Some comparative statistics for the past few years follow:

	54–55	*55–56*	*56–57*	*57–58*
Yearbook, individual membership	7,560	7,548	7,490	8,057
New members	472	639	835	1,040
Life members	16	23	9	18
Resignations	250	297	210	126
Deaths	42	51	45	38
Delinquent one year's dues	917	352	364	362
Delinquent two years', to be dropped	99	266	181	184
Address unknown, to be dropped	33	73	13	7
Applications to be approved	54	85	8	39
Individual dues	$49,652	$53,343	$54,127	$56,779

The YET membership campaign was more effective than last year, but every effort still needs to be made to expand membership. Twenty-one degree-granting institutions which are members of the Society had no new members during the year, and some others got a late start. Thus it is recommended that the YETs be asked to continue their efforts for another year on a "follow-up" basis. It is further recommended that the Executive Committee of each Division critically examine its membership and prepare a list of names of outstanding men who should be members and submit them to the Secretary so they can be contacted by means of a personal letter from the President and a follow-up letter from the Division Chairman.

4. *Institutional Membership.* Trends for the past few years are indicated by the following figures, which are the *Yearbook* totals, except for June 1, 1958.

	Feb. 56	*Feb. 57*	*Feb. 58*	*June 1, 1958*
Active	148	152	154	153
Industrial	110[1]	131[1]	132	150
Associate	—[1]	—[1]	9	9
Affiliate	20	39	41	48

[1] Industrial and Associate not separated.

The number of industrial members discontinuing membership during the year is six. Of the 150 listed, one has not paid dues for two years and replies to no letters, and one owes dues for one year.

5. *Subscriptions.* The number of paid subscribers as of June 1 is 432. No accurate records for past years are available. Since the income from this source increased about 60 per cent during the year, the 67 per cent increase in price had no great effect on the number. The listing of the JOURNAL in the publications of some of the subscription agencies, at a nominal cost, may have helped offset a normal decrease which otherwise might have been expected.

6. *Publications.* The publication dates for the JOURNAL OF ENGINEERING EDUCATION were changed to nine monthly issues starting with October, the *Directory-Yearbook* being a special Feb. 15 issue. All of the regular issues were mailed during the first two weeks of the appropriate month. The schedule proved satisfactory, and made the preparation of fall issues easier than in the past. The number of pages printed, 988, is the largest in the history of the Society. The particular cause for this large number is the inclusion of two special reports, the 59-page "Engineering Enrollments and Faculty Requirements, 1957-1967" and the 37-page "Facilities and Opportunities for Graduate Study in Engineering." Also satisfactory papers are being received at an increasing rate. There is a backlog of papers, so the immediate problem appears to be one of selection rather than of getting adequate quantity. The increase in advertising rates resulted in an increased income of about $4,900 over last year even though there was an average decrease of 1.2 pages per issue in the amount of advertising. It is thus concluded that the rate increase was justifiable. The fact that there was only a comparatively small decrease in amount of advertising probably resulted from the fact that employment ads were never accepted; the listing in Standard Rates and Data for the first time and the mail campaign also probably had some effect. The latter effort needs

to be renewed on a comprehensive scale.

Publications resulting from special studies by the Society during the year were:

1) The Engineering Sciences
2) Facilities and Opportunities for Graduate Study in Engineering
3) Engineering Enrollments and Faculty Requirements, 1957–67
4) Salaries and Earnings of Engineering Teachers, 1956
5) Engineering and Scientific Manpower Problems, an Annotated Bibliography.

In addition, there were the following new publications of a msicellaneous nature:

1) Nuclear Energy Education Newsletter
2) Brochure on Industrial Membership
3) Nuclear Energy Education Report No. 2 (Reprinted from the JOURNAL OF ENGINEERING EDUCATION)
4) An Engineer's Library, Guide to the Profession (Reprinted from the JOURNAL OF ENGINEERING EDUCATION)
5) Distribution of 6 news releases, not related to the Annual Meeting.

It also should be mentioned that ECRC published its biennial *Research Review.*

7. *Office Staff.* At the beginning of the year an extra girl was employed in the Secretary's office to handle the routine preparation of entries for the *Yearbook-Directory,* and thus free the editorial secretary for full-time work on the JOURNAL. This gave much relief to the Editor and a little to the Secretary's office. During the year plans were completed to increase the time the Editor devotes to ASEE publication from 20 per cent to 50 per cent and Mr. Paul T. Bryant of the University of Illinois was appointed Editor, effective September 1, 1958. This meets a real need and should result in many benefits. The next major problem is to increase the time the Secretary devotes to ASEE from 50 per cent to 75 per cent. The increase in all aspects of the Society's activities and desirable affiliations with other educational organizations requires more and more of the Secretary's time. Concurrently, the increase in general office work has meant less direct help from the office secretary. The budget for 1958–59 includes extra clerical help on about a half-time basis. This is needed because the constantly growing membership requires increasing amounts of the time of the membership secretary, and does not enable her to aid in other office work to a great extent; the same is true of the work of the yearbook secretary. This extra help should relieve the office secretary of more routine and enable her to be of greater assistance to the Secretary and to devote more time to the files, an area in need of attention.

8. *Office Equipment.* During the year a postage meter was purchased. In addition to the furniture and equipment for the new Editor, who will be in the headquarters building, the purchase of the following mechanical equipment is recommended in order to economize the time of the staff.

1) A ditto machine for producing ten to 50 copies of a letter.
2) A duplicating machine to avoid retyping to get copies of a letter.
3) Electric letter opener.

It is believed the proposed budget can include the purchase of all these machines.

9. *Secretary's Travel.* During the year the following meetings and conferences were attended by the Secretary. It should be noted that practically no meetings other than those directly related to an ASEE activity were attended. The lack of contacts in New York (EJC) and Washington are frequently disconcerting.

Date	*Occasion*
September 6–10	Nuclear Committee at Argonne National Laboratory, Executive Board, and Committee on Development of Engineering Faculties—Chicago, Illinois.
October 22–26	Technical Institute Survey Committee, Relations With Industry Steering Committee, ECPD Annual Meeting, Executive Board, and General Council Meetings—New York, N. Y.
October 29–30	Nuclear Committee—New York, New York.
October 31–Nov. 2	EJC's Conference on Higher Education—Chicago, Illinois.
January 9–10	Co-operative Engineering Division—Dallas, Texas.
January 30–31	College-Industry Conference—Ann Arbor, Michigan.
February 16–18	Nuclear Committee—Washington, D. C.
February 26–March 3	Evaluation Follow-Up Committee—New York, and meeting in Washington, D. C. regarding testimony at Senate Committee Hearing.
March 19	Nuclear Congress—Chicago, Illinois.
April 8–11	Local Committee—University of California at Berkeley.
April 12	Missouri-Arkansas Section—St. Louis, Mo.
April 17–20	Executive Board and Southeastern Section—Miami Beach, Florida.
April 29	Conference with Chairman of Ethics Committee—Chicago, Illinois.
May 10	Illinois-Indiana Section—Urbana, Illinois.
May 12–14	Council of Engineering Society Secretaries—Cleveland, Ohio.
May 19	EJC's Regional Conference—Chicago, Illinois.
June 16–20	Annual Meeting—Berkeley, California.

10. *Public Relations.* This still is a weak aspect of the Society's operations. Mr. J. I. Mattill is to be congratulated for accomplishing what he does by means of his long-distance operations, and in particular for arranging the press conference in New York City at the time the CDEF report was released. Six news releases, other than at the annual meeting, were distributed during the year; the number would have been greater had it not been for the inability of the Secretary's office to get them out in the month prior to the annual meeting. If ASEE is to speak for engineering education, and if ASEE is to be recognized by scientific and Federal organizations as a force to be considered and whose opinions are to be sought, the efforts to inform them of what we are doing must be increased. No solution is obvious, but it is hoped a procedure can be worked out during the year whereby getting out the releases is not always a desperation project. Mr. Mattill also is again operating the press room during the annual meeting, and he and MIT must be thanked for his release from normal duties to be of this service to the Society.

11. *Federal Legislation.* On two occasions during the year members of ASEE accepted invitations to testify before Congressional Committees regarding Federal aid to education; one was oral and the other written. In each case the testimony was based primarily on the CDEF report—the shortage of teachers and increased aid to graduate students and research in engineering. Several members of the Technical Institute Division also testified before a committee of each house of Congress, as members of the President's Committee; their central plea was that any program for higher education should include two-year terminal programs.

12. *Industrial Fellowships.* The third Leeds and Northrup sponsored

fellowship was awarded to Princeton University. The Committee made little or no progress on a brochure; the same is true regarding efforts to obtain additional fellowships. Leeds and Northrup is disappointed by ASEE's inactivity. There must be a change next year if the program is to develop as originally planned.

13. *YET Paper Contest.* Only 10 of the 16 Sections submitted papers this year, but the quality of the papers again improved. It was very apparent to the judges that authors were giving thought to expression, grammar, spelling,etc. Except for the two winners, the papers were closely grouped. One Section wished to have two papers considered after the closing date, because of confusion not the fault of the authors, but only one could be considered without causing undue delay and without violating the requirement of one paper per Section.

14. *Summer Schools.* The only Summer School materializing is one on "Principles of Learning in Engineering Education," jointly sponsored by the Educational Methods Division and the Committee for Young Engineering Teachers. It is being held at the University of California at Berkeley on June 20 and 21.

15. *Mid-Winter Meetings.* The Relations With Industry, Engineering Drawing and Cooperative Engineering Education Divisions held their usual meetings. RWI's College-Industry Conference at the University of Michigan on Jan. 30 and 31 was by far the biggest and best ever held. The Drawing Division met in Flint, Michigan, on Jan. 15–17, and the Co-op Division in Dallas, Texas.

16. *ECAC.* The exchange of information during the year seemed to be particularly good. Perhaps this was because of increased activities; the greater use of carbon copies of letters was very helpful in keeping the Secretary informed of what was going on.

17. *ECRC.* The biennial *Research Review* was published and plans developed whereby its future editing would be by the Editor of the JOURNAL OF ENGINEERING EDUCATION and distribution be by the Office of the Secretary.

18. *Projects.*

a. *Evaluation of Engineering Education Follow-Up:* Ernst Weber, Chairman. The reports of the six ad hoc committees on the engineering sciences and the committee on analysis and design have been published in a booklet entitled "Report on the Engineering Sciences." 5,000 separate copies have been printed. They are being distributed free at the Annual Meeting, but thereafter will be sold for 25¢ each. The complete report also will be published in the October issue of the JOURNAL. The balance in the account is about $1,500, which should be adequate to cover the cost of printing the 5,000 separates.

b. *Humanistic-Social Research Follow-Up:* G. A. Gullette, Chairman. The project apparently is inactive. It is suggested that if the Chairman agrees, the Committee be discharged and the $1,100 (approximately) remaining in the account be transferred to reserve for special projects.

c. *Graduate Study Project:* N. A. Hall, Chairman. The final report, entitled "Facilities and Opportunities for Graduate Study In Engineering," has been printed as a separate booklet and also is in the June issue of the JOURNAL. Copies are available at no cost to those attending the annual meeting, but thereafter they will be sold for 25¢ each. About $2,700 remain in the fund, but that does not include the $831.32 for printing the separate booklets. The inclusion of the re-

port in the JOURNAL caused the issue to be larger and more expensive than usual. It is thus recommended that at least $500 be transferred to the JOURNAL account to take care of the extra costs.

d. *Survey of Engineering Colleges' Research Capabilities:* E. A. Walker, Chairman. The survey is completed and copies of the report will be available for free distribution at the Annual Meeting barring last minute difficulties. 5,000 copies were printed and after the initial distribution they will be sold for 25¢ each. It is estimated that about one-fourth of the initial grant, or about $10,000, will remain unexpended.

e. *Survey of Technical Institute Education:* K. L. Holderman, Chairman. Plans for the publication of the final report will be made at the annual meeting. The balance in the fund is $1,600 plus unexpended advances made to the Director.

f. *ASEE–AEC Summer Institutes on Nuclear Energy:* Nuclear Committee. The nine jointly sponsored institutes and the attendance at each are as follows:

Basic Course

1) North Carolina State and Oak Ridge National Laboratory	22
2) Cornell University and Brookhaven National Laboratory	30
3) Purdue University and Argonne National Laboratory	29
4) University of California at Berkeley	24

Advanced Courses

5) Nuclear Metallurgy, Ames Laboratory	10
6) Reactor Theory, University of Michigan	20
7) Reactor Instrumentation and Control, Argonne National Laboratory	16
8) Chemical Processing, Hanford Works, General Electric Co.	10

Technical Institute

9) Pennsylvania State University and Argonne National Laboratory	30
Total	191

For each institute the applicants were screened by a committee to determine the adequacy of background and appropriateness of taking the course. The Institutes at Cornell, Purdue, and Penn State proved to be the most popular, the number of applicants far exceeding the capacities. Michigan nicely filled to capacity.

To administer the program the Secretary was released from his teaching duties one-quarter time for the academic year, and that salary increment was charged to the project. Plans are developing for additional Institutes next summer, but on a more restricted scale. The subject matter of the Advanced Institutes also probably will be changed. Charging one-quarter time of the time of the Secretary for the academic year should be continued next year. The balance in the fund is about $4,900, but much of this will be expended in the evaluation of the programs and budgeted transfers to other accounts.

g. *Technical Institute Book:* S. C. Hollister, Acting Chairman. The recommendations made by the Committee have not been carried out the bottle-neck being the Secretary. About $5,000 remains in the fund.

h. *Mathematics In Engineering:* F. C. Lindvall, Chairman. No further word has been received regarding the publication of papers in the JOURNAL. It is suggested that the matter be dropped if the financial arrangements between the California Institute of Technology, the University of Michigan, and the National Science Foundation are in order.

i. *Development of Engineering Faculties:* H. L. Hazen, Chairman.

This committee has had a busy year, culminated by its report "Engineering Enrollment and Faculty Requirements, 1957–1967." During the year it also published "Salaries and Earnings of Engineering Teachers, 1956." A brochure to be used to interest graduate students in teaching is in preparation, and funds have been requested to make an extensive study of the problems associated with the recruitment, the development, and the better utilization of faculties. A report to the Society will be made at the annual meeting. Though the initial efforts of the Committee were financed by a grant from the National Science Foundation, the Society was not refunded the expended portion of the $1,000 advance made to get the project under way. It is hoped the second financing will result in repayment.

j. *Scientific and Engineering Manpower Survey for Atomic Energy Programs.* L. V. McLean, Director. The survey has been completed and a report submitted to the Atomic Energy Commission. At the request of the Commission the project is being extended on a stand-by basis so that the IBM card file will be maintained intact and so that additional information from them can be obtained as the Commission desires. A report to the Society is being made at the annual meeting. Unexpended funds of about $3,300 are being used for the continuation.

k. *Nuclear Energy Education Newsletter.* Up to about 1,300 copies have been sent out monthly throughout the year. A balance of about $300 is in the fund, but additional charges are yet to come in. The Office of the Secretary maintains the mailing list and addresses the envelopes. The status for next year has not been determined.

19. *Intrasociety Relationships.* The communication between the various units of the Society continue to improve. It is believed the various units are accepting and responding to their responsibilities in such a way that the Society is beginning to function as a team rather than as a large number of independent units. Evidence of this comes in many ways, but in a large measure is due to the direct interest each of the vice presidents is taking in the units for which he is responsible. To them and to all who have helped make this another successful year, the Secretary expresses his most sincere appreciation.

Respectfully submitted,
W. Leighton Collins

Report of Vice President

FOR GENERAL DIVISIONS

The operations of the General Divisions throughout the past year have been directed toward special problems of interest to the members.

The Relations With Industry Division sponsored an excellent program at Ann Arbor in January, and the Winter meeting of the Cooperative Education Committee in Dallas in February was highly successful.

The Educational Methods Division and the Committee for Young Engineering Teachers have cooperated in sponsoring a Summer School in "Principles of Learning in Engineering Education." The sessions are to be in Berkeley 20 and 21 June [1958].

Other divisions and committees in the general group have continued their normal activities and most of

them have a full agenda at the Annual Meeting.

Special activities of the vice president in Society affairs include:

1. Representing the Executive Board at the meeting of the North Midwest Section at Minneapolis in October.

2. Presenting a paper on College-Industry Relationships at the Education session of the Annual Meeting of the Institute of the Aeronautical Sciences in New York in January.

3. Presenting a paper at the Education Conference held at the Nuclear Congress in Chicago in March.

4. Meeting with the Missouri-Arkansas Section in St. Louis in April. This included a talk at the luncheon meeting and participation in a division meeting in the afternoon.

5. Serving with vice president C. A. Brown and vice president elect E. C. Easton on a committee to explore the effectiveness of the divisional structure of ASEE.

Respectfully submitted,
GLENN MURPHY

Report of Vice President

FOR INSTRUCTIONAL DIVISIONS

The emphasis that was given to strengthening the divisional organization and activities in 1956–1957 has been continued during the past year. Each division now has an Executive Committee listed in the directory. Such a committee can provide leadership and continuity to the divisional programs. Most of the divisions now have Editors who can, through newsletters, keep the divisional members informed about plans and programs as well as serve as a liaison between the division and the JOURNAL Editor. A number of suggestions have been made to improve the quality of individual conferences. An article having to do with "reading" papers has been published in the JOURNAL.

Because the subject matter for which each division was originally responsible may have developed considerably or even shifted into new directions, it was suggested early in the year that each division take a fresh look at the scope of its interests and activities. Some of the divisions have already appointed committees to study and report at this meeting. Others are planning to initiate such a study.

During the past year I have attended business meetings of the Engineering Drawing Division, the Mathematics Division, the Mechanics Division, the English Division and the Physics Division. In addition, I attended the mid-year meetings of the Relations With Industry Division and the Engineering Drawing Division. In May, I represented the Executive Board at the Annual Meeting of the Michigan Section. At all of these meetings there was a lively and well informed concern for the best interests of engineering education.

For future consideration I should like to suggest that the Society study its divisional structure and operation to determine the best methods of unifying the efforts of the individual divisions. While it is essential that the Society be organized so that all aspects of engineering education are represented, we are beginning to reach a point at which the General Council will become unwieldy and tend to defeat the purpose for its

existence. We should therefore make plans for the growth and development of the Society that will insure a continuation of its aims and objectives.

Finally, I should like to express my appreciation for the honor of having served as a Vice President of the Society for the past two years.

C. A. BROWN

Report of Vice President

FOR EASTERN SECTIONS

Introduction

This has been a very busy and active year for the Eastern Sections of ASEE, all of which held well-attended meetings during the academic year 1957–58. Interest in attending these meetings is undoubtedly a reflection, in part, of the nation-wide interest evidenced during the past year with respect to education, not only by the educators themselves, but also by the public as a whole. The excellent programs prepared by the program committees of the various sections were also important factors in promoting attendance.

Numbers of Meetings and Attendance

The Eastern Division of ASEE consists of nine sections, seven of which held one meeting during the course of the year. The Middle Atlantic Section held two meetings, and one section, the National Capital Area Section, held three evening meetings. The duration of the meetings varied. Four sections met for one day each, three for a day and a half, one for two days, and one, as mentioned above, held three evening meetings. As stated earlier, attendance was good. According to the reports received from the Section secretaries, 2,986 people registered for the meetings of the nine sections, of which 1,714 were members of ASEE. This means that about one-third of the members of the Society located in the territory covered by the Eastern Sections attended at least one section meeting. It indicates considerable vitality and interest on the part of the members of the Society. The sections provide an excellent medium through which large numbers of the members of the Society may participate in programs and discussions.

Financing Meetings

The method of financing the operations of the sections varies. Most sections charge a registration fee of those attending the meetings. The registration for the five sections making such charge ranges from $.50 to $4.00, with three of them charging $2.00 or $2.50. Only one section charges dues—$1.00 per year—and one section assesses each of the colleges participating in the Section activites $20. The question was raised as to whether a college which is not a member of ASEE may become a member of a section. This matter was thoroughly discussed by the Executive Board of ASEE and the Board ruled that a college which is not a member of the national Society may not be a member of a section. A nonmember institution, however, may be affiliated with a section and may be invited to participate in the activities of a section and to contribute to the cost of its operation. It cannot, however, be listed as a member of the Section.

Topics

While each section planned its programs independently of the others it would appear that the topics which are of interest to engineering educators are pretty much the same the country over. Some of the major areas of discussion were the following:

A. *Curricula.* There was discussion of the administration of curricula, the process of graduate study, adjusting freshmen to engineering curricula, engineering science in an ideal curriculum, the new versus the traditional in engineering discipline, trends in graduate engineering education, post-collegiate education, etc. One section devoted an entire meeting to accreditation, discussing in particular ECPD's current policy with respect to accreditation. Closely related to curricula were topics such as current problems in engineering education, industry's stake in engineering education, continued engineering education for tomorrow, etc.

B. *Engineering faculties and engineering teaching.* Topics in these areas included, what has industry done to maintain engineering faculties?; the future needs for engineering teachers; engineering teaching as a career; orientation, training and development of engineering teachers; selection of potential teachers; attracting and keeping capable young men in engineering education. Included in the general area of teaching were discussions of some of the operational aspects, such as class sizes, multiple sections, educational TV, economics in engineering education, and technical subject matter.

C. *Research.* This was another area which was of interest to several sections. Papers were presented on digital computers, engineering research at the undergraduate level, industrial sponsorship of research, motivation of research, sponsorship and tools of research, and education for research and development.

D. *General.* Engineering educators also gave evidence of being aware that the technical institutes will play an increasingly important part in the education of our technical personnel of the future. Two discussions were devoted to this subject, one under the title, "The Role of the Technical Institute," and the other, "The Engineering College's Role in the Development of Technical Institutes."

Closely related to most subjects discussed was that of manpower, but two meetings were specifically devoted to the shortage of engineers, scientific manpower needs, technical manpower needs, etc. Only one meeting was given over to a discussion of secondary school education, with the emphasis being placed on "raising the level of scientific education in our secondary schools." The National Capital Area, for one of its meetings, featured a visit to the Naval Research Laboratories where the functions and applications of the Laboratories' atomic reactor facilities were explained. There was also one session of a section meeting devoted to the problems and activities of the YETs.

YET Paper Contest

Reports from the secretaries of the sections indicate that participation in the YET paper contest was weak. In one section, no papers were submitted, and in two sections only one paper was submitted. In two sections there were two papers; in one section, three; in two sections, four; and in one section, seven papers. In

view of the fact that in only one section out of nine were more than four papers entered in the section contest, the question is naturally raised as to the merits of continuing the YET paper contest, particularly when one considers that there are probably, in the Eastern Sections, possibly 500 or more young engineering teachers who are eligible to participate. While commenting with respect to the YET papers, I should report that the consensus of the members of the executive committee of one of the sections was that the YET program serves little purpose and that even nationally, it tends to segregate the YETs from their technical interests and from contact with the older members of the Society. I mention this because I know that the officers of the section which made the comment were sincere and would like their opinion given consideration by the appropriate committee of ASEE.

Miscellaneous

In another report which I received, the writer commented on the planning of the programs. His comment was to the effect that the viewpoints and problems of the large universities in which graduate work and research are pursued have, to a great extent, very little in common with those of technical institutes and smaller undergraduate colleges. I think this is a pertinent comment, and I include it with the hope that those who are preparing programs for the coming year will keep in mind the nature of the membership of the sections which they serve. What is of considerable interest to a large university may be of slight interest and have no significance, other than being of general interest, to a small undergraduate college or to a technical institute. Conversely, a program in which all of the discussion is devoted to technical institutes may not be of interest to faculty from a large university.

To keep the officers of the various sections aware of what was going on in the other sections, I endeavored, so far as possible, to procure sufficient copies of the programs of each section, which, in turn, I sent to the chairman or secretary of each of the other sections in the East.

Finally, it is worthy of mention, that the New England Section publishes a rather extensive Bulletin. Contained in the Bulletin is information such as enrollments, staff additions, staff promotions, resignations, new curricula, new buildings, plans for the future for each college which is a member of the Section.

Branches

Although no specific reports were received concerning the activities of branches, it should be noted that some of the branches have been active in a less formal way, and undoubtedly their influence has served to stimulate participation by their members in the activities of the several sections.

Conclusion

We trust that those who are attending this meeting, and those who will attend the other meetings at Berkeley, will return to their sections with much valuable information and renewed enthusiasm, which will result in the continued growth of their sections and development of worthwhile programs for their meetings. For the coming year, it is suggested that the sections give thought to including in their programs discussion of the report of the Committee on Development of Engineering Faculties and, when released, discussions of the follow-up report of the Evaluation of Engineering Education.

Respectfully submitted,
R. W. Van Houten

Report of Vice President

FOR WESTERN SECTIONS

Excellent programs and general interest in problems of education contributed to the attendance at the annual meetings of the Western Sections of ASEE during the academic year of 1957–58.

Meetings and Attendance

The Western Division of ASEE consists of seven sections. All of these held one regular meeting during the year, and the Pacific Southwest Section held two additional meetings with the junior colleges in California. On April 19, the Pacific Southwest Section met with the Southern California Junior College Association at Orange Coast College, where matters of importance to ASEE were presented by Bonham Campbell of the University of California at Los Angeles; and on April 26, the Section held a similar meeting with Northern California Junior College Association at Santa Rosa Junior College with Professor Carlton E. Cherry of Marin College as the principal speaker. At the suggestion of President Fred Lindvall, a projected follow-up of the 1956–57 College-Industry Conference was postponed. The Missouri-Arkansas Section scheduled a one-day meeting; however all other Sections planned a program extending over a day and a half.

Not counting wives, the total reported attendance was 998. As an official of the Society, I attended the Rocky Mountain Section meeting at Colorado School of Mines (Golden, Colorado) and the Pacific Northwest Section meeting at Oregon State College (Corvallis, Oregon). It is quite evident that Section meetings provide an excellent opportunity for members of the Society to participate in programs and discussions relating to Society affairs.

Finances

Four Sections charge registration fees. These range from one dollar to two dollars and fifty cents. As far as it is known, no Section charges Section dues. Presumably, expenses of Section meetings are financed generally by local assessment or by the host institution. The Pacific Southwest Section embraces a large geographical area, and it is extensively organized to function in a manner quite similar to that of the National Society. The Section wants more funds primarily for travel expenses for officers and committee chairmen; but at this time, I do not believe that any of the proposals made by the Pacific Southwest Section can be used to afford financial relief to this Section.

Topics

Each Section planned its program independently of the others, but there are many topics of general interest and a number of these were discussed at almost every Section meeting. Aside from the business session, and usually a banquet with a speaker who discussed a topic of general interest, there was a wide diversity of program material. Worthy of mention are: research, curricular problems, divisional or departmental sessions, relations with industry, graduate engineering education, development of professional attitudes in students, and high school relations. In several instances inspection trips were used to advantage. The theme of the Rocky Mountain Section meeting was "The Engineering Teaching Profession." There were six group discussions with a

moderator and recorder, and these were followed up by a summary of reports of group coordinators and general discussion. This provided an interesting, worthwhile, and inspirational program which was highly praised by those in attendance. Several sections scheduled a dean's meeting for the discussion of problems of mutual interest.

YET Paper Contest

Reports from the secretaries of sections indicate that participation in YET Paper contest was weak. Some secretaries ignored the question, and others reported no papers. A maximum of three papers was reported from one Section. Because of this situation, a question may fairly be raised as to the merit of continuing the YET Paper Contest. Although the YET program was designed for the purpose of encouraging activity on the part of young engineering teachers, I think there is definite feeling that this program may now have questionable value and that the younger members of the Society might be well integrated with the older members at an earlier age than now obtains.

Branches

Although no specific reports concerning the activities of branches were made, it should be noted that at some institutions there are branches which operate in the somewhat informal manner. Undoubtedly, the influence of the branches has served to stimulate participation in the activities of the Sections.

Conclusion

I am requesting the secretaries of the various Western Sections to send me sufficient copies of their programs to permit distribution to the other Western Sections. I believe that this interchange of information will be most useful in planning future programs.

In the planning of programs for the coming year, I suggest that consideration be given to development of interest in the engineering teaching profession, the Report of the Committee on the Development of Engineering Faculties and discussion of the Report of the Follow-up Committee on the Evaluation of Engineering Education.

Respectfully submitted,
C. L. Eckel

Annual Report: 1957–58

ENGINEERING COLLEGE ADMINISTRATIVE COUNCIL

Officers and Committees

Officers of the Engineering College Administrative Council for 1957–58 were: Chairman, R. A. Morgen, Purdue University; Secretary, H. E. Wessman, University of Washington.

Executive Committee members were: Dean Elmer C. Easton, Rutgers University; Dean Paul E. Hemke, Rensselaer Polytechnic Institute; Dr. J. Robert Van Pelt, President, Michigan College of Mining & Technology; Dean A. T. Granger, University of Tennessee; Dean R. H. Roy, Johns Hopkins University.

Committee Chairmen were: International Relations—Professor Harold W. Bibber, Union College; Manpower—Donald L. Pyke, Ramo-Wooldridge Corporation; Military Affairs—Dean J. Harold Lampe, North Carolina State College; Secondary Schools—Dr. J.

F. Downie Smith, Carrier Corporation; Selection and Guidance—A. R. Hellwarth, Detroit Edison Company; Accreditation by Individual States—Dean Elmer C. Easton, Rutgers University.

Executive Committee Meetings

The Executive Committee held its fall meeting on October 25, 1957, at the Statler Hotel, New York City, in conjunction with the annual meeting of the Engineers' Council for Professional Development. The minutes of this meeting were distributed to the membership as Bulletin XXIII, dated November 25, 1957.

A luncheon meeting of old and new members of the Executive Committee and committee chairmen is scheduled for Thursday, June 19, at Berkeley, California.

Nominations and Election

At the June 1957 Executive Committee meeting at Cornell, a Nominating Committee consisting of Past Chairmen W. T. Alexander, W. L. Everitt, and J. H. Lampe was appointed. This committee proposed the following slate of new members for the Executive Committee: Dean Gordon B. Carson, Ohio State University (now Vice President), Dean Lee H. Johnson, Tulane University, and Dean George H. Marston, University of Massachusetts. These gentlemen were nominated to fill the vacancies created by the expiration in June 1958 of the terms of Dean E. C. Easton, Dean P. E. Hemke, and Dr. J. R. Van Pelt.

One ballot was mailed to each of the 153 member institutions. 131 ballots were received by the Secretary. 22 ballots were not returned. All of the 131 ballots approved the slate as recommended by the nominating committee.

Committee Activity

A brief summary of each committee report for 1957–58 is submitted herewith. The complete report of each committee is in the files of the Secretary, ECAC.

1. *Committee on International Relations*—H. W. Bibber, Chairman.

The Committee sponsored a conference on International Relations at Cornell University on Thursday, June 20. Dr. W. R. Weems of Massachusetts Institute of Technology and Mr. Maynard M. Boring of the General Electric Company were the principal speakers.

The Committee also sponsored a conference on foreign engineering educators at Cornell on Friday, June 21. Engineering teachers from Free China, Israel, Turkey, India, and the United States were present. The meeting was a closed session and no record was kept of the discussions. It was believed that this promoted a freer exchange of ideas and comments about educational patterns here and abroad.

The Committee is also sponsoring a conference at the University of California on Thursday afternoon, June 19.

2. *Committee on Manpower*—Donald L. Pyke, Chairman.

The Committee met in New York City on Thursday, October 24. Discussion centered around the possible effect on the future supply of scientists and engineers of (a) the changes in defense spending policies, and (b), recent publicity implying that a shortage of engineers no longer exists. The Committee has planned an interesting program for Tuesday afternoon, June 17, at the University of California. Papers on the program will report on (a) recent developments affecting the supply and demand for

engineers and scientists, and (b) the future supply and future demand.

3. *Committee on Military Affairs*—J. H. Lampe, Chairman.

The report of the Military Affairs Committee was circulated with Bulletin XXV dated May 15, 1958; the Committee has continued to work with the representatives of the armed services and with the American Association of Land Grant Colleges and State Universities in behalf of obtaining the best working arrangements for ROTC programs in conjunction with engineering curricula. The Committee however, does not make any specific recommendations as to the amount of academic credit to be allowed for ROTC programs. It believes that (a) the operation and academic evaluation of ROTC courses and programs must be done at the individual educational institution level, keeping in mind the objectives of engineering education and also those of the ROTC programs, and (b) the evaluation of ROTC courses and programs from an academic viewpoint should be guided by the studies and concepts of engineering education and ECPD which require proper emphasis on the humanities and social studies in scientific courses in addition to the engineering program.

It has been suggested to all of the services that the Military Affairs Committee will be glad to join with them at any time in studying the objective of developing new ROTC programs for engineering students which would be oriented to the needs of the services.

4. *Committee on Secondary Schools*—J. F. Downie Smith, Chairman.

The Committee on Secondary Schools has not been too active. In the recent past, its main activities have been connected with stimulation of high schools toward more rigorous training in mathematics and the physical sciences. So much of this activity is now being carried on by other agencies, it seemed unwise for the Secondary Schools Committee to take too active a part this year except as individuals. Several members of the Committee including the Chairman have talked at various meetings on this topic.

The Committee has proposed a reconsideration of the functions to be performed by the Secondary Schools Committee because of overlapping with the Committee on Selection and Guidance. During the year, overlapping activities with the Educational Committee of the RWI Division have been eliminated.

A closed meeting of the Committee will be held at Berkeley. The Committee is also sponsoring a conference on secondary education for future engineers.

5. *Committee on Selection and Guidance*—A. R. Hellwarth, Chairman.

The Committee continued its activities on a number of fronts. The Engineering Graduate Placement Research Project is still active. Cooperating companies have continued testing new engineer employees. The next step will be to validate the tests.

A reading list for engineering students was prepared and published in the January 1958 JOURNAL. The Committee believes that further work can be done in the preparation of reading lists suitable for upper high school students, college students, and young professional engineers. This work should be correlated with that of ECPD and professional societies who are engaged in preparing similar bibliographies.

The Committee, in cooperation with

the ECPD Guidance Committee, has sent an offer of assistance to the directors of the summer institutes for high school teachers which are being sponsored by the National Science Foundation. Over 100 summer institutes for secondary school teachers are being held this year.

A subcommittee headed by Don Bridgman is undertaking a study on the problem of college drop outs.

Studies are underway to coordinate the work of this Committee on Selection and Guidance with the work of the Secondary Schools Committee and the work of the Relations With Industry Division. This will eliminate overlapping and guarantee coverage of necessary duties. A chart showing interrelationships and proposed committee organizations for ASEE dated May 5 has been mailed to committee members and other interested persons for consideration and comment.

The Committee is sponsoring an open breakfast meeting on Wednesday, June 18 at Berkeley devoted to a discussion of guidance at the high school level.

6. *Ad Hoc Committee to Study Accreditation by Individual States*—Elmer C. Easton, Chairman.

A year ago there was reason to hope that the Education Department of the State of New York would simplify its elaborate procedure for registering those engineering curricula which had been accredited by ECPD. Unfortunately, no improvement has been made. The Department is still insisting on the filling out of a questionnaire much more elaborate than that used by ECPD. A number of engineering colleges among them Rutgers, Tufts, and the University of Massachusetts, have not returned the questionnaires which were sent out during the past year.

This committee has asked the National Commission on Accrediting to take the leadership in bringing about a change in the policy of the New York State Education Department. Dr. William K. Selden, the Executive Secretary of the Commission, has been working actively on this problem. In particular, he has brought the matter forcefully to the attention of the new Deputy Commissioner of Education, Dr. Frank R. Kille. Dr. Kille replaced Dr. Nyquist in this position early in 1958.

At a meeting held on March 1, 1958, the National Commission discussed the New York situation. Dr. Nyquist was present. Unfortunately, the reaction appears to have been rather emotional. As a result of this discussion, the Commission appointed a committee to study the matter. Members of the committee are President Whitaker of Lehigh (Chairman), President Wessel of Tufts, and President Johnson of New Hampshire. It is proposed that Dr. Whitaker make arrangements for himself, Dr. Selden and me to visit the Education Department in Albany. Presumably this will be done during the summer after Dr. Whitaker returns from a trip to Europe.

E. *Federal Legislation.*

The ASEE Committee on Federal Legislation under the chairmanship of H. K. Work, New York University, has cooperated with the Secretary, ECAC, during the year in the preparation of reports concerning the measures in Congress to aid education. These reports have been included in Bulletin XXIV, dated February 14, 1958; Supplement to Bulletin XXIV, dated February 20, 1958; and Bulletin XXV, dated May 15, 1958. These bulletins have been sent to members and have alerted them as to the need for making representations to their Congressmen in order to

insure that any program of aid to education incorporates support for graduate study and research in engineering. The views of the engineering educators have been brought to the attention of the committees in the House and in the Senate considering the education bills by your officers and by other engineers. To date, the results of these representations are not manifest. The bills are still in committee however and the eventual outcome is hard to predict.

F. *Executive Committee Bulletins*

In addition to the Executive Committee Bulletins noted above, Bulletin XXII, dated October 1957, and Bulletin XXIII dated November 25, 1957, were circulated to the membership.

G. *Program for the Berkeley Meeting*

The events sponsored by the ECAC have been published in Bulletin XXV and also in the Programs for the 66th Annual Meeting of ASEE at the University of California. Details will not be repeated here. Suffice it to say that the general session sponsored by ECAC on Thursday, June 19, is devoted to a continuation of the subject of improvement of engineering education through effective utilization of faculties and facilities initiated a year ago at Cornell. The program this year is centered on case histories for better use of facilities and staff.

Respectfully submitted,
HAROLD E. WESSMAN
Secretary

ARNOLD NAMED DIRECTOR

Dr. Lee Arnold, noted authority on aeronautics, has been named director of the Daniel Guggenheim School of Aeronautics and professor and chairman of the department of aeronautical engineering at New York University's College of Engineering.

The announcement was made October 7 by Dean John R. Ragazzini of the College of Engineering. Dr. Arnold has been professor of civil engineering and engineering mechanics at Columbia University's School of Engineering.

NEW MEMBERS OF ASEE

New Individual Members

As of September 4, 1958

ACKERMAN, ADOLPH J., Consulting Engineer, 1250 Sherman Ave., Madison 3, Wis. W. T. Alexander, W. Leighton Collins. C. E.

ALBRECHT, WILLIAM P., Professor and Chairman of English, University of Kansas, Lawrence, Kan. John S. McNown, Geo. M. Beal. Engl.

BEIGHTLER, CHARLES S., Instructor in Industrial Engineering, Northwestern University, Evanston, Ill. Robert N. Lehrer, Ali Bulent Cambel. I. E.; Math.

BLANCO, ERNESTO ENRIQUE, Professor of Engineering Drawing, Universidad de Villanueva, Marianao, Habana, Cuba. L. O. Johnson, Irwin Wladaver. Engr. Dwg.

BODOR, STEPHEN J., Instructor in Mathematics and Physics, Lowell Technologic Institute, Lowell, Mass. James W. Bell, Frederick B. Bischoff. Math.; Phys.

BOOKER, HENRY G., Professor of Electrical Engineering, Cornell University, Ithaca, New York. Casper L. Cottrell, Benjamin Nichols. E. E.; Phys.

BOWLES, LEON E., Instructor in Engineering, Tuskegee Institute, Alabama. Jefferson D. Davis, Jr., W. Leighton Collins.

BRANDT, DANIEL A., Assistant Professor of Mechanical Department, Milwaukee School of Engineering, Milwaukee, Wis. Thomas I. Lyon, Arvid W. Carlson.

BRENNAN, CHARLES W., Assistant to the Dean, College of Engineering, Director of Engineering Freshmen, Lehigh University, Bethlehem, Pa. L. V. Bewley, James B. Hartman. Adm. Educ.; I. E.

CLARK, DAVID H., Instructor, American Technical Institute, Akron, Ohio. Thos. J. Rung, Frank A. Flannery. Tech. Inst.

CHANDIRAMANI, ARJANDAS B., Educational Attache, Embassy of India, 2107 Massachusetts Ave., N.W., Washington 8, D. C. W. T. Alexander, W. Leighton Collins. Adm. Educ.; Tech. Inst.

DUDLEY, JOHN H., Assistant Commandant, U. S. Army Engineer School, Fort Belvoir, Va. J. D. Strong, Edward E. Pickard. Adm. Educ.; C. E.

ELITHARP, RICHARD M., Specialist–Engineering Education HMEE, General Electric Co., Syracuse, N. Y. Alden M. Jones, John B. Russell. Adm. Indus.; E. E.

FREEMAN, DAVID RODGER, Instructor in Industrial Engineering, Northeastern University, Boston, Mass. Wm. T. Alexander, Arthur E. Keating. I. E.

GADSDEN, CHRISTOPHER P., Assistant Professor of Electrical Engineering, Tulane University, New Orleans 18, La. James A. Cronvich, M. M. Gilkeson. E. E.; Phys.

GARRETT, WILLIAM R., JR., Assistant Professor of Civil Engineering, Merrimack College, North Andover, Mass. Gerald J. Kirwin, W. F. M. Longwell. C. E.

GOODMAN, JAMES RICHARD, Instructor in Civil Engineering, Colorado State University, Fort Collins, Colo. R. D. LaRue, W. Leighton Collins. C. E.; Mech. & Mat.

GRANGER, GEORGE A., JR., Drawing Instructor, Mechanical Engineering Department, Tri-State College, Angola, Ind. Stanley V. Radford, Raymond A. Hemmert. Engr. Dwg.; C. E.

GREGORY, DELMAR R., College Representative, International Textbook Company, Washington, Ind. Robert A. Nottenburg, Kenneth R. Gromlich. Adm. Ind.

HALPERT, VIOLET BERYL, Assistant Professor of English, Polytechnic Institute of Brooklyn, Brooklyn, N. Y. Herman Grau, C. E. Schaffner. English; Phys.

HAMEL, DANA B., Executive Vice President of Ohio Mechanics Institute, Cincinnati, Ohio. Donald C. Metz, G. Ross Henninger. Adm. Educ.

HOFFMAN, ALBERT A., JR., Instructor in Civil Engineering, Saint Louis Univer-

sity, St. Louis, Mo. John F. McCarthy, V. J. Blum, S. J. C. E.

JOHNSON, HOWARD O., Assistant for Program Development, Training Division, Bureau of Naval Personnel, Washington, D. C. Harold E. Wessman, Austin V. Eastman. Adm. Educ.; E. E.

JOHNSON, HOWARD W., Associate Dean, School of Industrial Management, Massachusetts Institute of Technology, Cambridge, Mass. Arthur L. Townsend, John T. Rule. Adm. Educ.; Hum. Soc.

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LAWSHE, C. H., Dean of Technical Extension and Adult Education and Director of the Summer Sessions, Purdue University, Lafayette, Ind. R. A. Morgen, G. A. Hawkins. Adm. Educ.; Tech. Inst.

LEVISTER, ERNEST C., JR., Instructor in Engineering, Tuskegee Institute, Alabama. Jefferson D. Davis, Jr., W. Leighton Collins.

LOVELESS, HOWARD L., Assistant Professor of Industrial Engineering, University of Tennessee, Knoxville, Tenn. Howard P. Emerson, Robert M. LaForge. I. E.; Text. Engr.

MALLINSON, GEORGE G., Dean, School of Graduate Studies, Western Michigan University, Kalamazoo, Mich. Glenn V. Edmonson, Wm. D. McIlvaine. Adm. Educ.

MANCI, ORLANDO J., JR., Graduate Assistant in Aeronautical Engineering, Air Force Institute of Technology, Wright Patterson Air Force Base, Ohio. V. S. Haneman, Jr. D. W. Breuer. Aero. E.; E. E.

MASCH, FRANK D., JR., Instructor in Civil Engineering, University of Texas, Austin, Tex. Walter L. Moore, Carl W. Morgan. C. E.

MEIER, EDWIN ARNOLD, Assistant Professor of Mechanical Engineering, Milwaukee School of Engineering, Milwaukee, Wis. Thomas I. Lyon, Arvid W. Carlson. Tech. Inst.

MORGAN, BERNARD STANLEY, JR., Graduate Assistant in Aeronautical Engineering, Air Force Institute of Technology, Wright Patterson Air Force Base, Ohio. V. S. Haneman, Jr., D. W. Breuer. Aero. E.; E. E.

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MCCOOL, JOHN C., Assistant Director, American Technical Institute, Akron, Ohio. Thos. J. Rung, Frank A. Flannery. Tech. Inst.

NOVKOV, DAVID A., Engineer-Instructor, American Technical Institute, Akron, Ohio. Thos. J. Rung, Frank A. Flannery. Tech. Inst.

PUCKETT, RAYMOND B., Instructor in Technical Institute, University of Dayton, Dayton, Ohio. Maurice Graney, D. C. Metz. Tech. Inst.; I. E.

RAMSEY, HOWARD EARL, Instructor, American Technical Institute, Akron, Ohio. Thos. J. Rung, Frank A. Flannery. Tech. Inst.

RENSHAW, ALFRED H., The Ronald Press Company, 15 East 26th St., New York 10, N. Y. George W. Farnham, W. Leighton Collins.

SKATRUD, RALPH O., Manager Engineering, J. L. Training, International Business Machines Corporation, Kingston, N. Y. W. T. Alexander, W. Leighton Collins. Adm. Ind.

SMITH, GARLAND, A., Instructor in Engineering, Tuskegee Institute, Alabama. Jefferson D. Davis, Jr., W. Leighton Collins.

STEVENSON, PAUL N., Associate Professor of Agricultural Engineering, Kansas State College, Manhattan, Kan. Reed F. Morse, Geo. H. Larson. Agr. E.

STEWART, HARRIET B., Instructor in Engineering Drawing and English, Lain Technical Institute, Indianapolis, Ind. Thelma J. Lain, David L. King. Engr. Dwg.; Engl.

UPSON, JOHN FIELD, Publishers Representative, College Department, D. Van Nostrand Co., Princeton, N. J. Theo-

dore A. Saros, Adrian N. Clark. Adm. Ind.

VOLZ, CARL, Associate Professor of Electrical Engineering, Pennsylvania State University, University Park, Pa. Kenneth Hunter, V. E. Neilly. E. E.

WALKER, THEODORE HAVARD, Instructor in Industrial Engineering, North Carolina State College of Engineering and Agriculture, Raleigh, North Carolina. Clifton A. Anderson, Robert G. Carson. I. E.; Engr. Econ.

WENK, I. P., Director of Personnel and Training, Republic Aviation Corporation, Conklin Street, Farmingdale, Long Island, N. Y. Walter M. Hartung, C. S. Jones. Admin. Indus.

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ZWINCK, CARL H., Associate Professor–Industrial Division, State University of New York, Agricultural and Technical Institute, Morrisville, N. Y. D. E. Irwin, Robert J. Carter. Tech. Inst.; Coord. of Coop. Engr.

52 new members this list
72 previously added this fiscal year

124 new members this fiscal year

New Affiliate Members

Alliance Technical Institute, Cambridge Springs, Pennsylvania....Dr. A. P. Coleman, President

The Community College and Technical Institute of Temple University, 1808 Spring Garden St., Philadelphia 30, Pa....Dr. Robert L. Johnson, President

Oklahoma City University, Oklahoma City 6, Okla....Jack S. Wilkes, President

Southern Illinois University, Carbondale, Ill....D. W. Morris, President

DeVry Technical Institute, Inc., 4141 Belmont Ave., Chicago, 41, Ill.... T. J. Lafeber, President

State University of New York, Agricultural and Technical Institute, Alfred, N. Y.... P. B. Orvis, Director

New Industrial Members

General Motors Styling, General Motors Technical Center, Warren, Michigan. Representative: Peter Kyropoulos, Executive in charge of Technical Development

International Business Machines Corporation, Electric Typewriter Division, Engineering Laboratory, Northern Belt Highway, Lexington, Ky. Representative: H. S. Beattie, Manager of Engineering, Electric Typewriter Division

Michigan Bell Telephone Company, 1365 Cass Ave., Detroit 26, Mich. Representative: A. R. Meacham, General Engineering Personnel Supervisor

Department of the Navy, EXOS, Office of Industrial Relations, Washington 25, D. C.